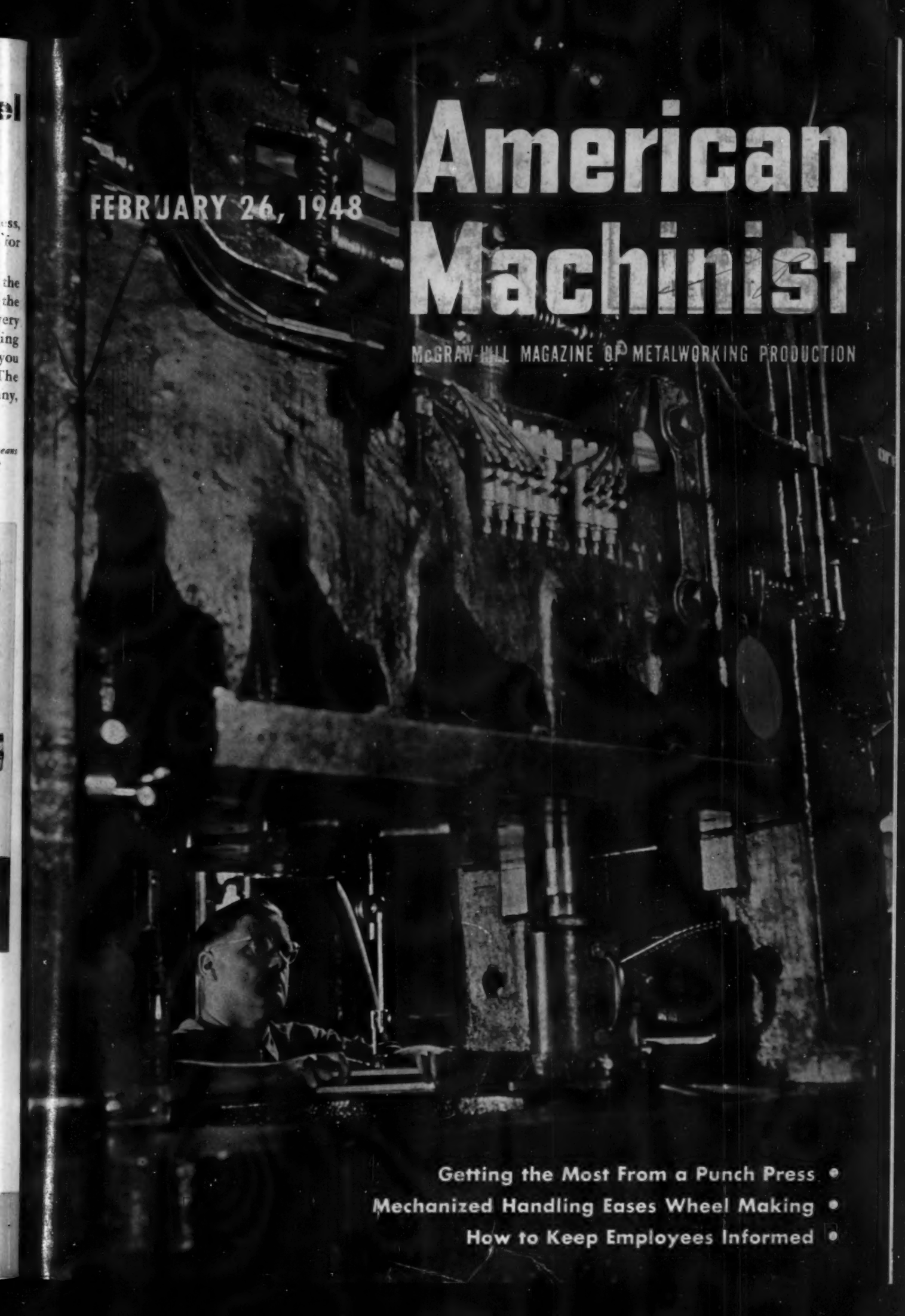


FEBRUARY 26, 1948

American Machinist

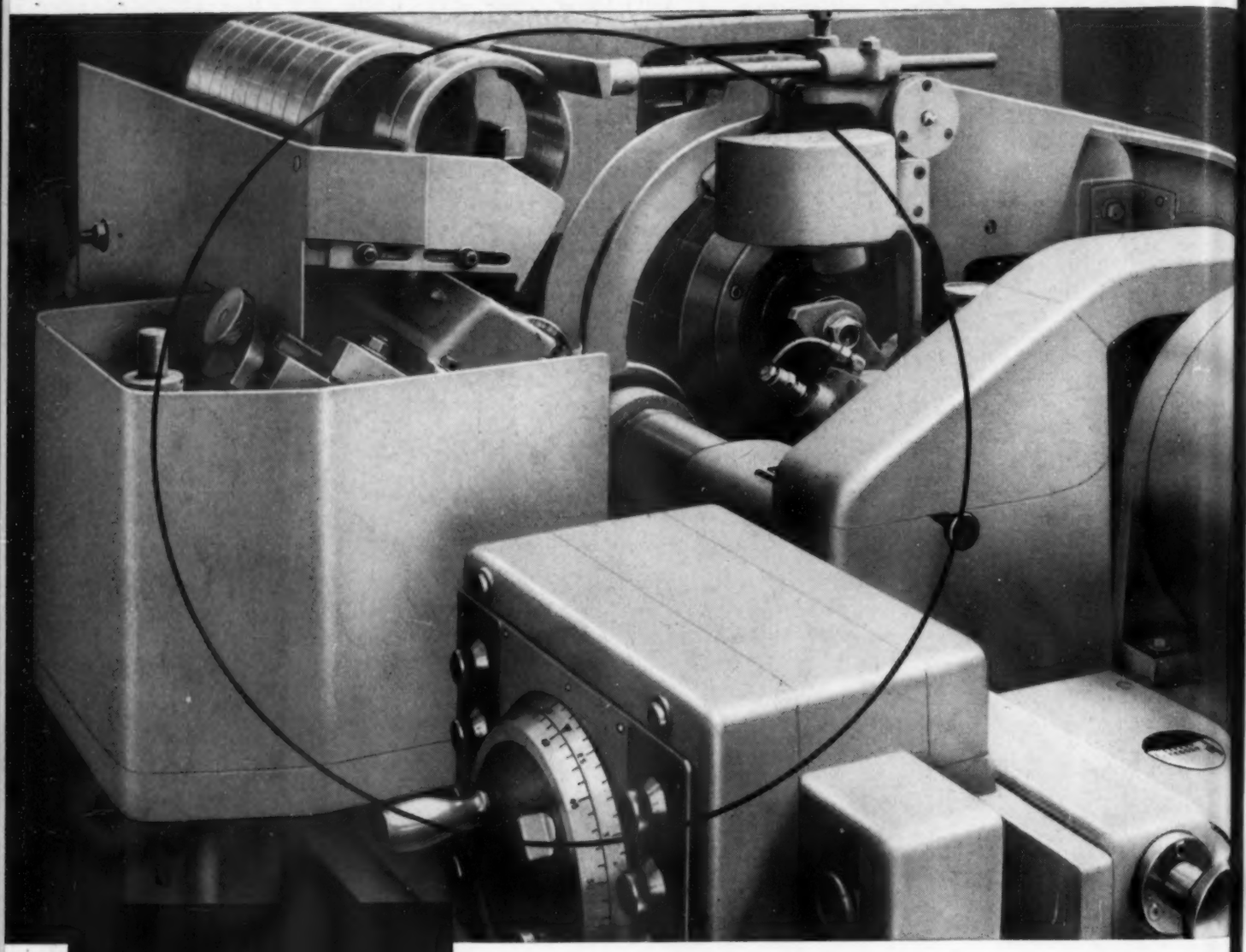
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Getting the Most From a Punch Press •

Mechanized Handling Eases Wheel Making •

How to Keep Employees Informed •

LOADS, GRINDS, UNLOADS *Automatically*



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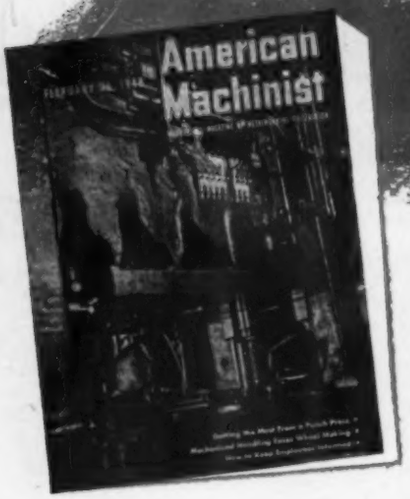

Chips and QUIPS

Our Cover ... A. Wallin, Punching, Tool & Die Division, Schenectady plant, General Electric, checks a double-crank straight-side press for parallelism of ram face and bed. The check is made with the ram hanging free and with it under pressure of about 3/5 rated press tonnage. Comparative readings are taken with an indicator at six points on the ram face. The Kodachrome is by Burns of GE at Schenectady, points up the 7-article series on "How to Get the Most Out of Punch Presses," which begins in this issue.

Copper Finishing ... Our special report in this issue is really a preview, being one section of the forthcoming *ASM Handbook*. We were collecting data for a special report on working copper and its alloys, found that in one segment of the work, at least, we were asking for information that the same experts had already prepared as a committee. So we've edited the committee report, added illustrations, and here it is. The *Handbook* is expected out in April.

We Blush ... Special reports continue to be reader favorites. Says Lee Donnelley, handling the Educational Program of the Drop Forging Assn., in discussing our 2-part report on Forging: "It becomes more and more apparent as time goes on that you did a grand job in preparing these articles. Members of the Association are continually asking for copies, which are used for training personnel and educating customers. Many non-members are requesting copies. Thanks again for your able handling of a difficult subject . . ." Our liberal reprinting of the two on broaching fixtures is almost exhausted, demand is rapidly depleting our stock on the die-casting one (Dec. 18). And we still get orders from the first ones we published — over two years ago. Best of all, most of the orders include compliments — which strengthen our determination to turn out even better reports. What subjects would you like treated?

Instability ... Fred C. Victory, chief engineer of Moore Special Tool, found that dimensions of precise mechanisms changed unpredictably. He sought answers from many authorities, found that most cases of dimensional instability of metals can be traced to four factors. Causes and corrective measures for cases of thermal expansion he discusses in this issue; in two later articles he takes up unstable consitutents in hardened steel, internal and applied stresses.

Mechanized Unloading ... Handling and plant layout are key problems in any mass-production operation. At Norris Stamping & Mfg. Co., Los Angeles, they are the answer to successful production of auto wheels. Before the war, Norris was a job shop, but Ordnance work brought high-production methods. For this line, manhandling has been avoided wherever possible, machine unloading frequently is semi-automatic.

Control ... Axelson had a broadly useful production control setup in its lathe manufacturing — recently sold. We considered it useful enough to bring it to you herewith. The same system is now applied, incidentally, in Axelson's oil-well equipment lines.

Glass Cutter ... North American Aviation faced with the job of fabricating Fiberglas, which is highly abrasive, has worked out applications of carbide for routing required shapes economically. Methods and tools make a 1-page story.

Coming ... March 11 *A.M.*, our Tool Show Number — in honor of the ASTE Exposition in Cleveland beginning March 15 — will include a comprehensive special report on work handling to machines. Associate Editor LeGrand has compiled information from many sources on the vital problem of speeding feed and injection on machine tools to bring these operations to the same level as machining itself. The issue will also include a floor plan and list of exhibitors at the Tool Show and a number of articles pointed particularly at the problems of the tool engineer. For example, planning tool costs, tooling for machining a taper-lock unit, handling dimensional instability (part 2 of a series) gun drilling, and so on.

PUNCH MAN . . . I. H. Girardet, author of the current series on "How to Get the Most Out of Punch Presses," has had over 23 years of experience in the fields of tool and die making and tool, die, and machine design. At present he is foreman of tool design, Punching, Tool & Die Div., General Electric Company's Apparatus Dept., Schenectady, N. Y.

A graduate of the General Electric Apprentice Course, he has authored several articles on tool and die application. A past-chairman of Chapter 20, A.S.T.E., he has also taught tool design in a technical high school and in a New York State Vocational School, and at Rensselaer Polytechnic Institute in the War Program.

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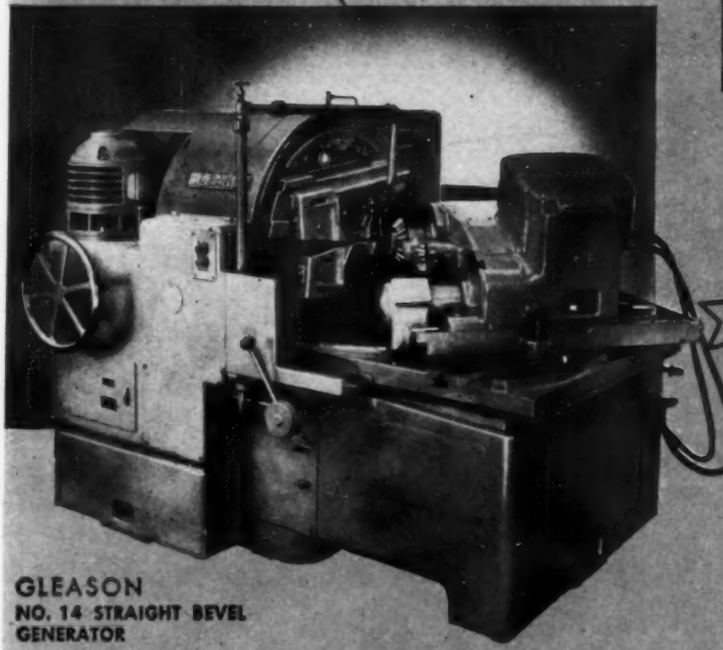

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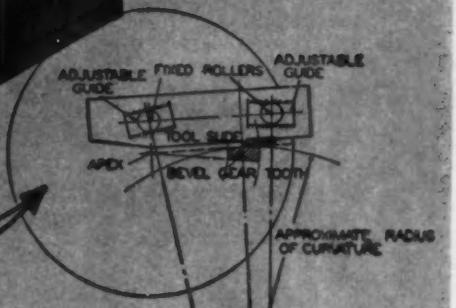

The latest development for the simple control of tooth bearing in Coniflex gears is the universal angular adjustments of rollers and guides incorporated into the design of the new Gleason No. 14 Straight Bevel Generator. Any desired amount of localization can be readily obtained by a rapid dial setting.

Angular adjustments of guides control curvature lengthwise of teeth.

The Gleason Unit for Coniflex Gear Production combines the many advantages of the new Gleason No. 14 Straight Bevel Generator . . . faster cutting . . . positive control of tooth bearing . . . simplicity of operation . . . with the ease of accurate sharpening of cutting tools on the No. 12 Generator Tool Sharpener. Continuous testing on the No. 13 Universal Gear Tester before, during and after cutting assures not only uniform production but simplifies final assembly by pre-establishing the best running position of the gears.

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CINCINNATI Projecto-Form Grinding Machine. Catalog M-1612 contains complete specifications. Write for a copy.

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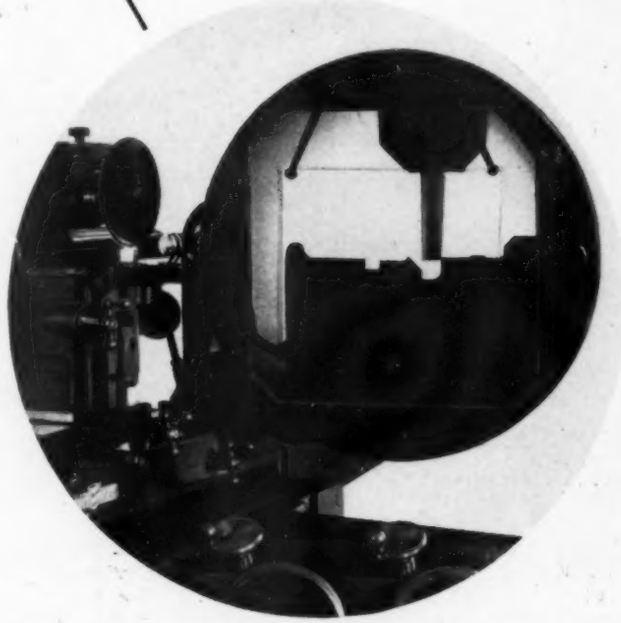
Projecto-Form GRINDS TRUE TO FORM

Seeing is believing when you're operating the new CINCINNATI Projecto-Form Grinding Machine. You see exactly what's happening, for the point of action is enlarged twenty times and projected on a vertical screen in front of the operator. And it's easy to grind true to form. A "drawing" of the desired shape is made by cutting away the tinted translucent emulsion on a glass plate. Mounted behind the ground glass viewing screen, the drawing constitutes the outline to which the work is ground. The accuracy that you see on the screen is improved twenty times on the work. That's because the width of line on the drawing is .004". If the work is ground until its projected image falls within this line, then the work is accurate within .0002"! ¶ CINCINNATI Projecto-Form has a wide range of applications in grinding form tools and small dies. You may obtain complete information by writing for catalog M-1612.

Below: This is the way the work looks from the operating position. It's easy for the operator to follow the grinding action because the work and drawing are enlarged twenty times and brightly illuminated.



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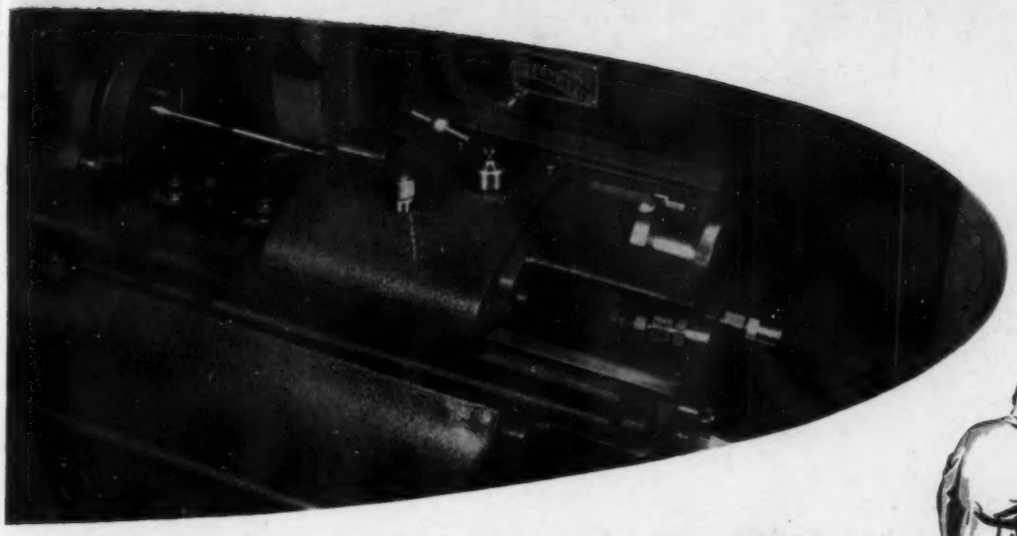


Left: HYDRAULIC FOOTSTOCK on CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. In conjunction with loading cradles, it eliminates the operation of manually placing and removing the work between centers.

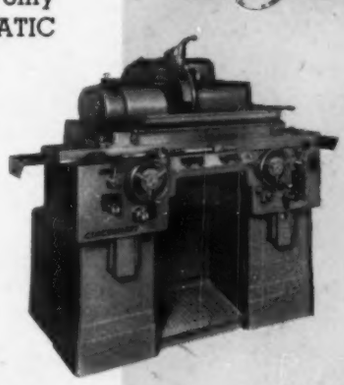
Moving the infeed lever to "In" initiates the automatic cycle . . . footstock center engages work; work rotates and coolant starts; grinding wheel rapidly advances, grinds, tarries for sizing, and retracts; coolant stops and work stops rotating; footstock center retracts.

manual effort DOWN . . . production UP

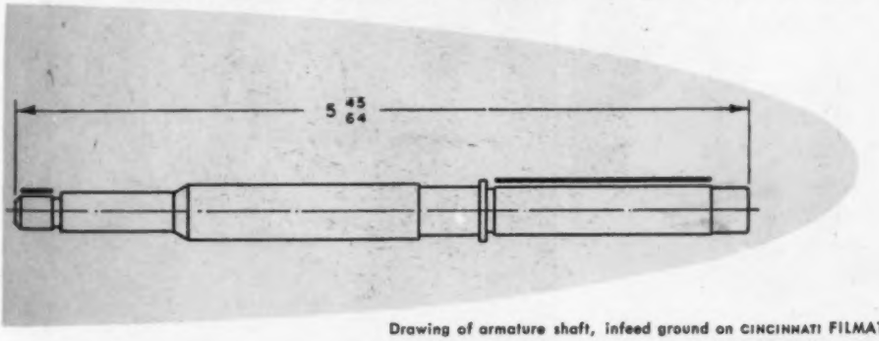
IN GRINDING 200 ARMATURE SHAFTS PER HOUR

When worker fatigue diminishes, production goes up. It's an old axiom, proved again by the equipment illustrated above. Here, armature shafts are ground at a production rate of 200 per hour. The machine is a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder with production features consisting of: 1) Automatic Infeed Attachment, and 2) Hydraulic Footstock. These two features constitute an automatic infeed cycle which greatly reduces fatigue and increases production. And the grinding wheel spindle bearings will never interrupt this increased rate of production for they're FILMATICS; they require no attention. ¶ It's only natural that a workman will turn out more work on a CINCINNATI FILMATIC 4" Plain Hydraulic because exceedingly close attention and time-consuming motions of the hands have been greatly reduced. There are other advantages, too. Write for literature.

CINCINNATI



CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machines are built in 4" x 12", and 4" x 18" sizes. Complete specifications may be obtained by writing for catalog G-551.



Drawing of armature shaft, infeed ground on CINCINNATI FILMATIC 4" Plain Hydraulic equipped with Automatic Infeed and Hydraulic Footstock. Production is 200 per hour for each diameter. Tolerances ½ of blueprint allowance. Heavy lines indicate two ground diameters.

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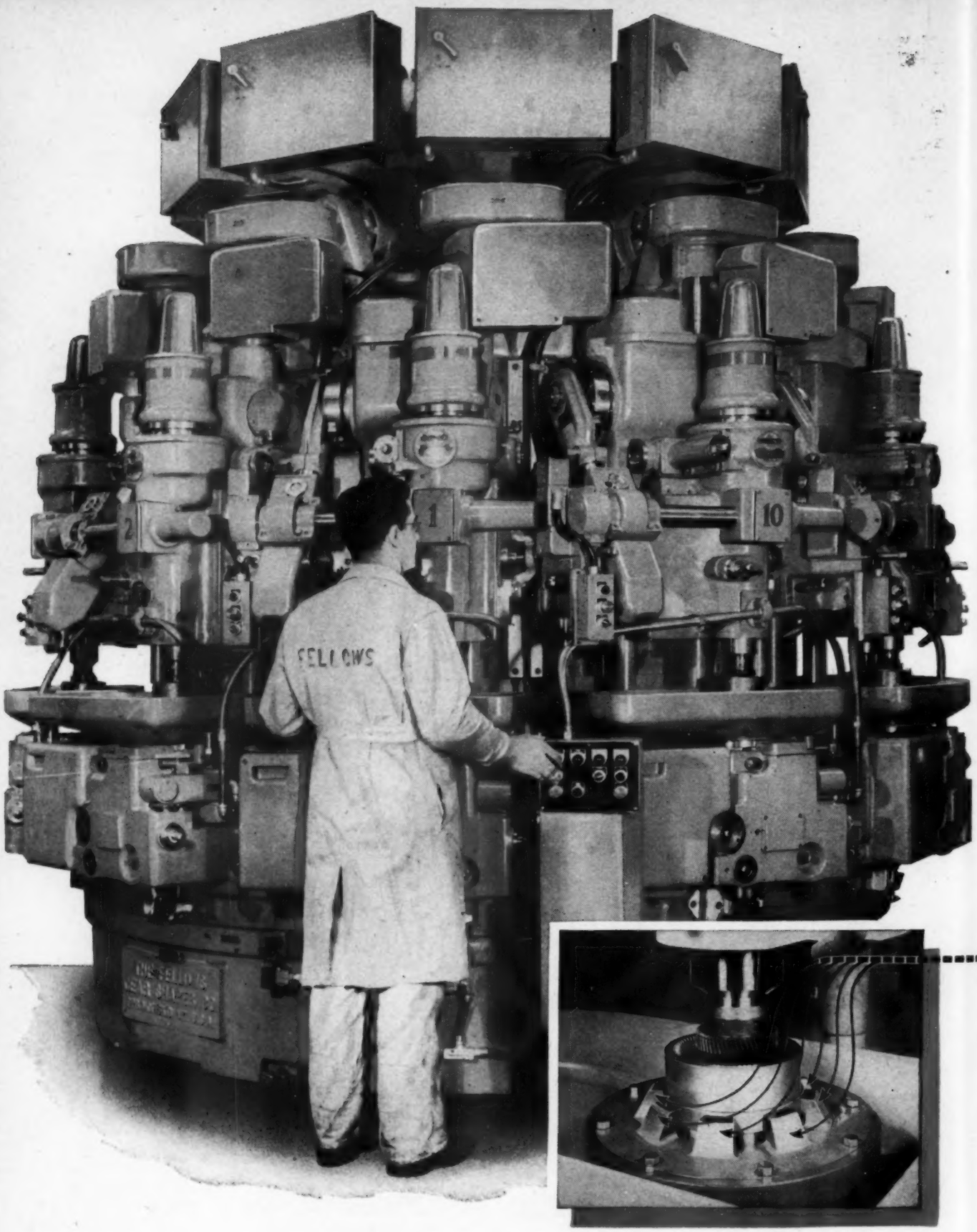
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1
10
2

Ahead in MAN-EASE OPERATION, too

Fellows "Ten-Station" Design Includes Quick-Acting Fixtures that Really "Give the Operator a Break"

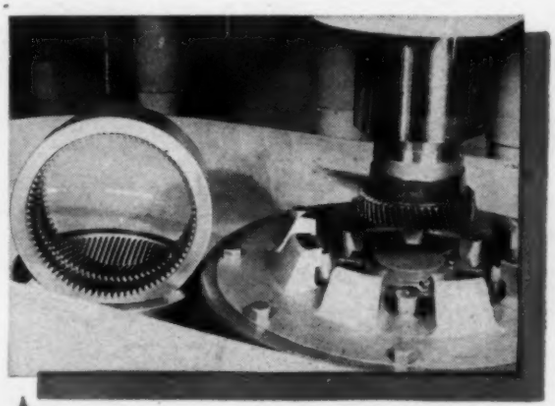
His overall job is simple. The machine, itself, has "time-cycle" controls which function automatically. The loading and unloading of work is easy, and is done without haste or fatigue-strain.

Quick clamping fixtures reduce the seconds of actual man-effort to a fraction of the available unloading-loading time.

The multiple-unit rotary design of the machine permits the use of many types of fully or semi-automatic work holding devices, pneumatic, mechanical, or electrical.

Automatic stopping mechanisms protect against possible spoilage through misalignment of work, or temporary absence of the operator.

The No. 10 Rotary Gear Shaper is truly engineered for mass production of accurate gears. Let us study your gear problems with a view to increased production. Contact the Fellows office nearest you.



★ **Integral diaphragm-type chuck jaws release and grip ring gear automatically**

This outfit for holding an internal helical ring gear is a good example of the automatic fixtures that really "give the operator a break". A unique diaphragm-type chuck activates the clamping and releasing of the gear blank... timed to turret rotation of the machine. Signal lights on the control panel notify the operator when the work is unclamped and clamped, and when to start each unit cutting again.

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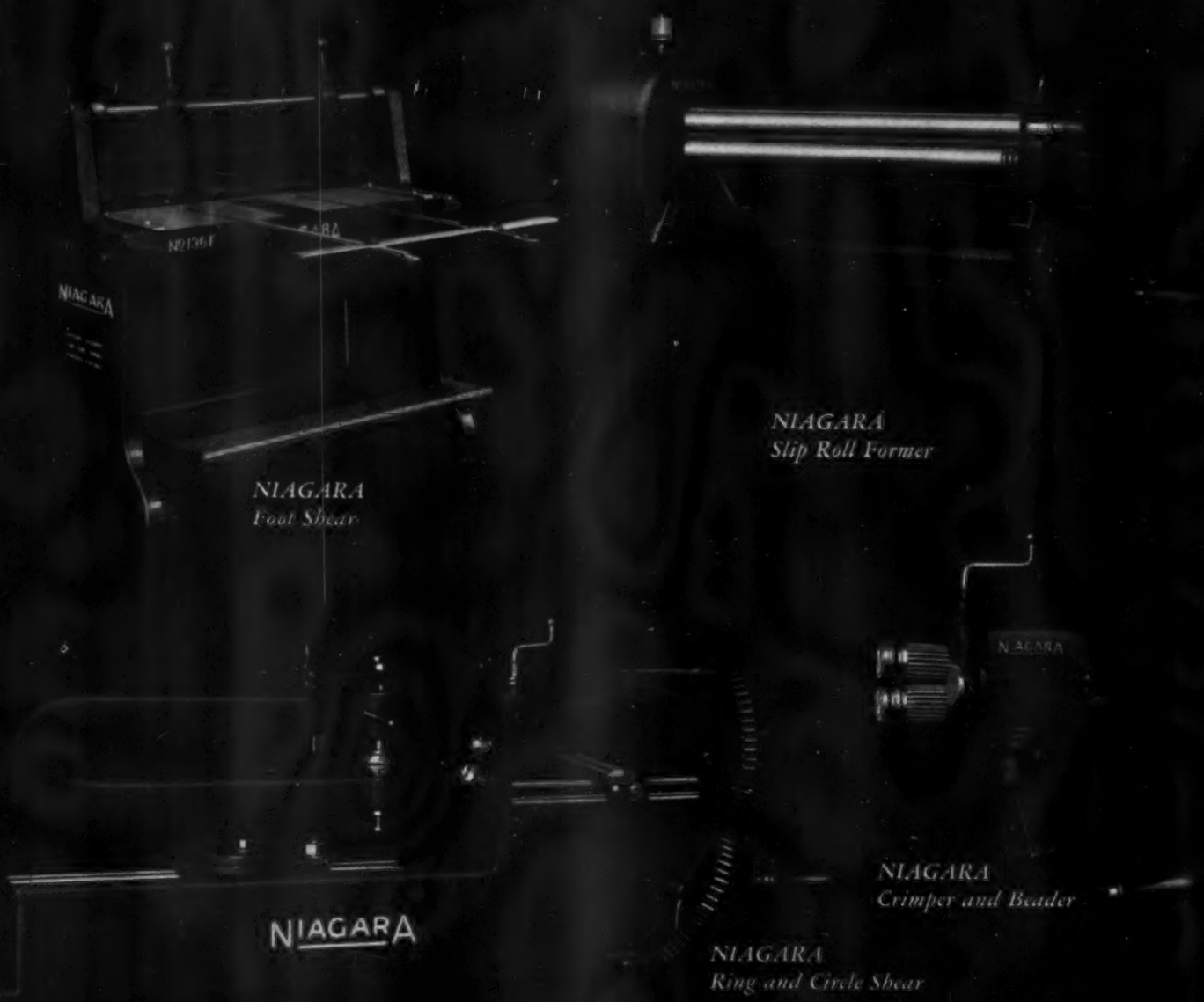

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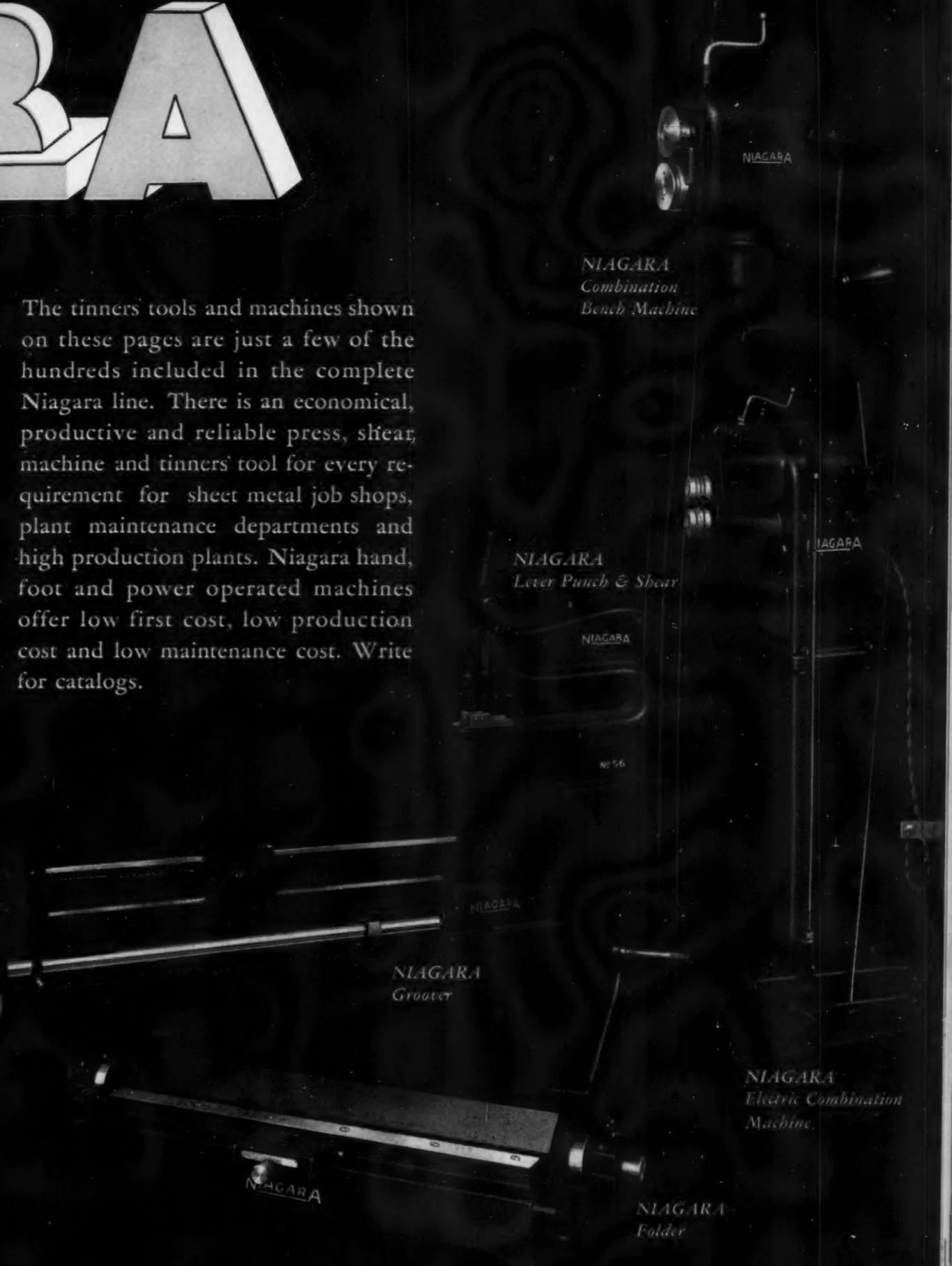

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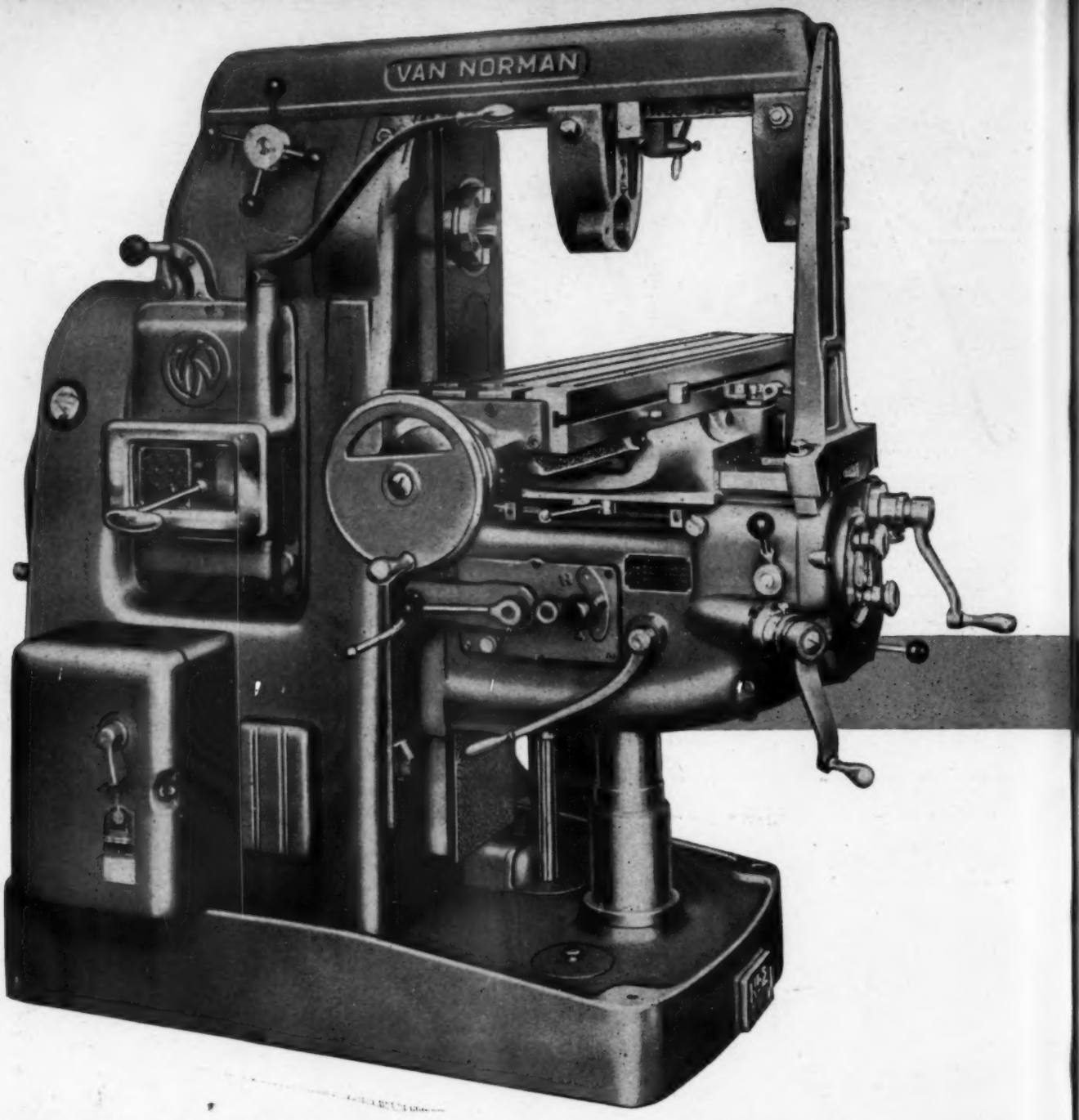

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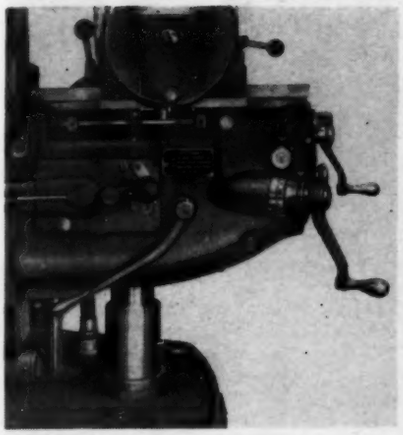
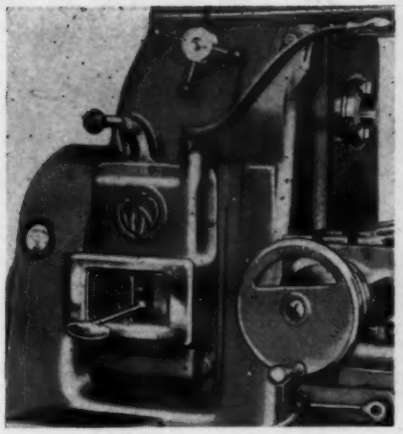
Increases Production...Cuts Milling Costs. The No. 2 Medium Van Norman Miller is a rugged, dependable, efficient milling machine designed for medium and light work. Available in either plain or universal models, it will increase your production and reduce milling costs.

The new Spindle design incorporates a heavy built-in flywheel which improves and increases the cutability of the miller . . . assures uniform finish of the work piece. Front and rear directional controls provide ease of control and operation . . . minimize excessive and waste operating motions. Large dials make hand adjustments easy. Load meter permits operator to operate machine at full cutting capacity without fear of overloads.

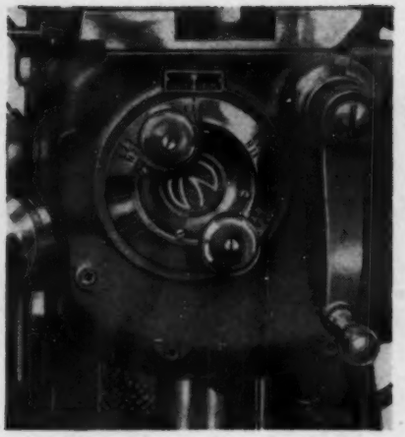
Investigate the Van Norman No. 2 Medium Miller today. Write for information and Bulletin.



FRONT AND REAR CONTROL of all power feeds and six-way rapid traverse permits operation from either position. Worker fatigue is reduced and control simplified as operator has complete visibility of the milling operation. Controls are directional providing maximum operator safety.



SINGLE LEVER SPEED SELECTOR, spindle reverse and conveniently located adjustable spindle clutch lever assure ease of spindle control. The spindle clutch lever for starting and stopping the spindle is easily positioned for greatest convenience of operation from either front or rear.



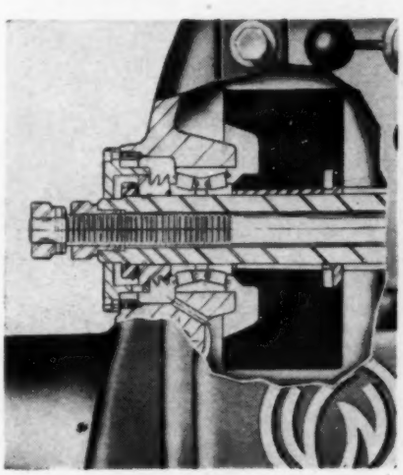
VAN NORMAN ROTARY-TYPE FEED SELECTOR located on the front of knee and high-low series lever located on side of knee permit quick, easy selection of the proper feed for every cutting speed. 12 feeds are available from ½" to 36".

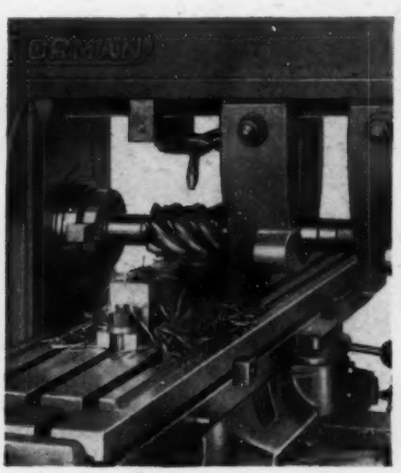
FRONT AND REAR CONTROLS SIMPLIFY CONTROL AND OPERATION OF THE NO. 2 MEDIUM MILLER

HEAVY BUILT-IN SPINDLE FLYWHEEL plus the large bull gear, improves cutability by assuring smooth, uniform transmission of power to the cutter under every type of cut. The result — smooth, even, vibration-free cutting at every speed and feed.

LOAD METER located on the left side of column gives visual indication of the percent of load that machine is being operated under. It enables the operator to get full use of power available and helps to prevent overloading of the machine.

SPINDLE FLYWHEEL provides uniform transmission of power to the cutter even on the heaviest slab milling cuts. Arbor supports and outer brace assure rigidity. Controls of all power feeds are directional.





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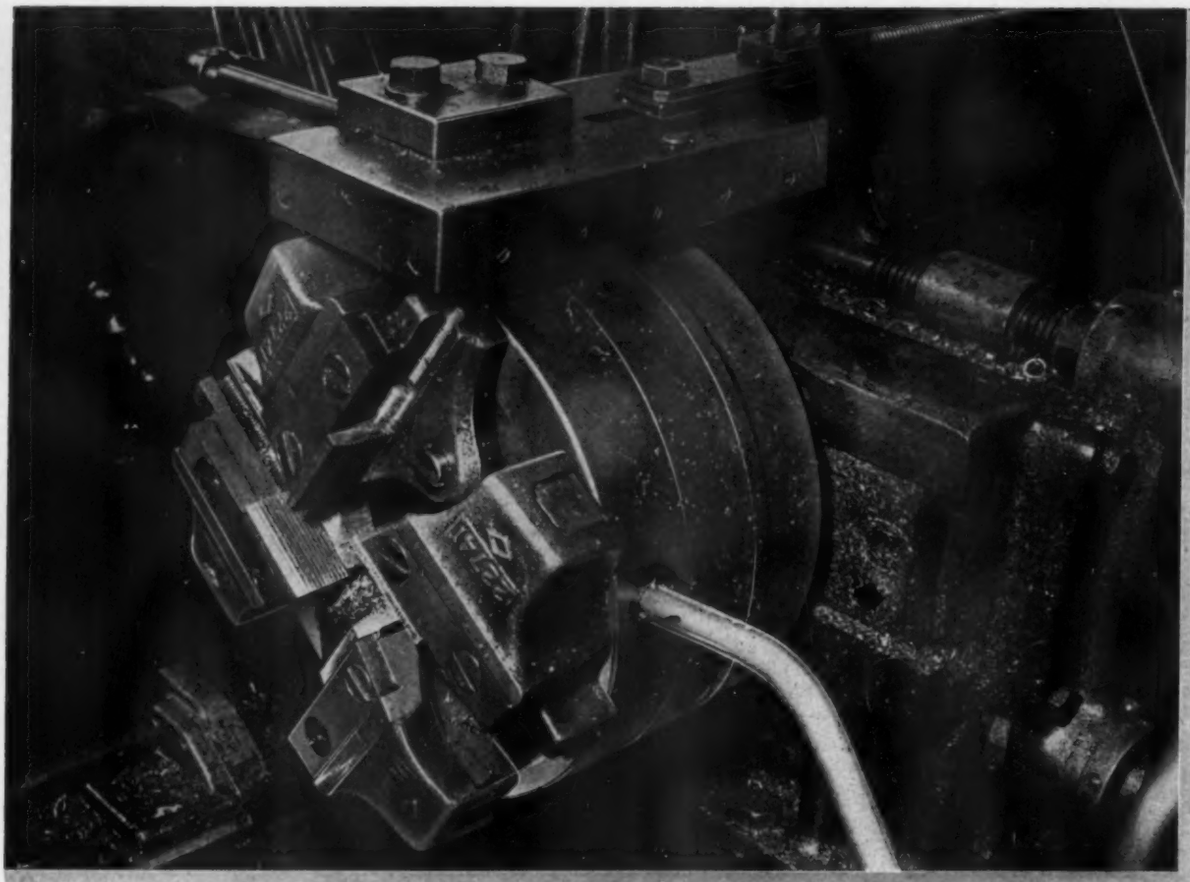
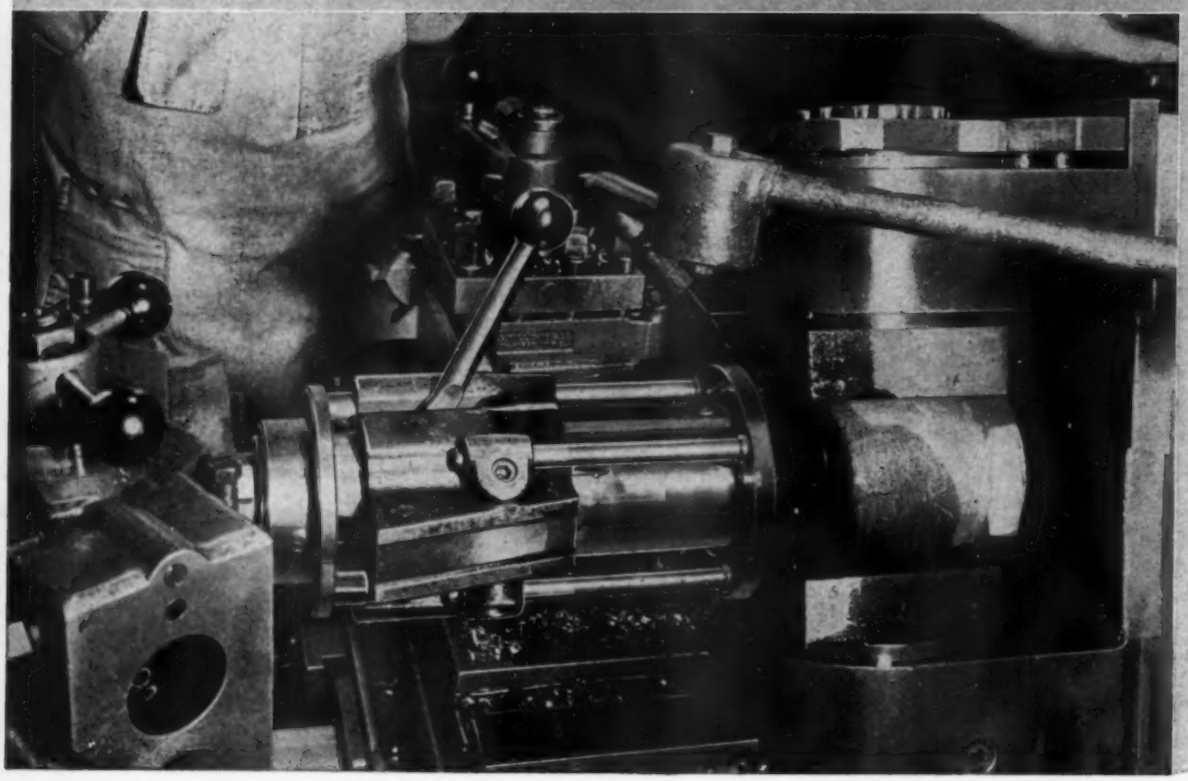
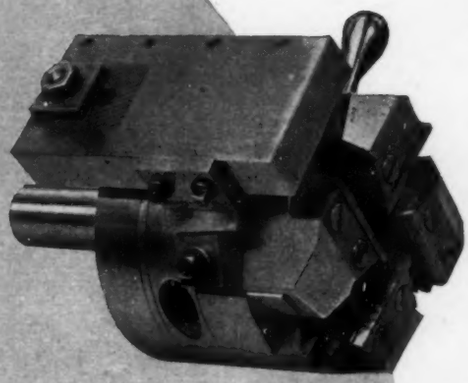
SPRINGFIELD 7, MASS.

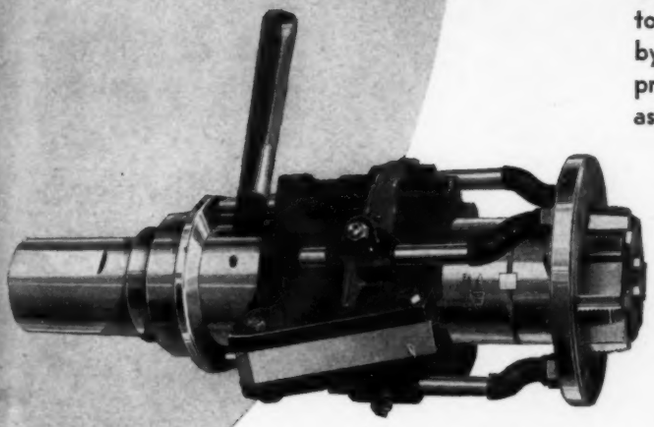
FOR INTERNAL





AND EXTERNAL Tapered Threads





LANDIS THREADING EQUIPMENT PRODUCES WELL-FORMED AND EXTREMELY ACCURATE THREADED PARTS

Landis equipment is illustrated on the opposite page producing tapered pipe threads. At the top, the LANDMATIC Taper Attachment Die Head is applied to the Landis Pipe Threading and Cutting Off Machine for producing tapered threads on Stainless Steel Pipe. At the bottom, the Landis Style LM Receding Chaser Collapsible Tap is applied to a turret lathe to produce tapered pipe threads in 3" Stainless Steel Valve Body Castings. The Taper Attachment Die Head and the Collapsible Tap have also been illustrated separately to give a better view of their construction details.

The use of LANDMATIC Taper Attachment Die Heads and LM Receding Chaser Collapsible Taps enables an Eastern manufacturer of Stainless Steel Valves to thread parts in a highly efficient and satisfactory manner at minimum cost. The cutting action of the chasers used in the die heads and taps is limited to the throat section instead of over the entire width of the chaser by the receding mechanism of the tools. This makes possible the production of threads without chaser "leave-off" marks and assures smooth finished threads as well as long tool life.

Write for Bulletins F-90—(Taper Attachment Die Head)
G-81—(Receding Chaser Collapsible Tap)

LANDIS TRADE MARK REG. U.S. PAT. OFF.

LANDIS
MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

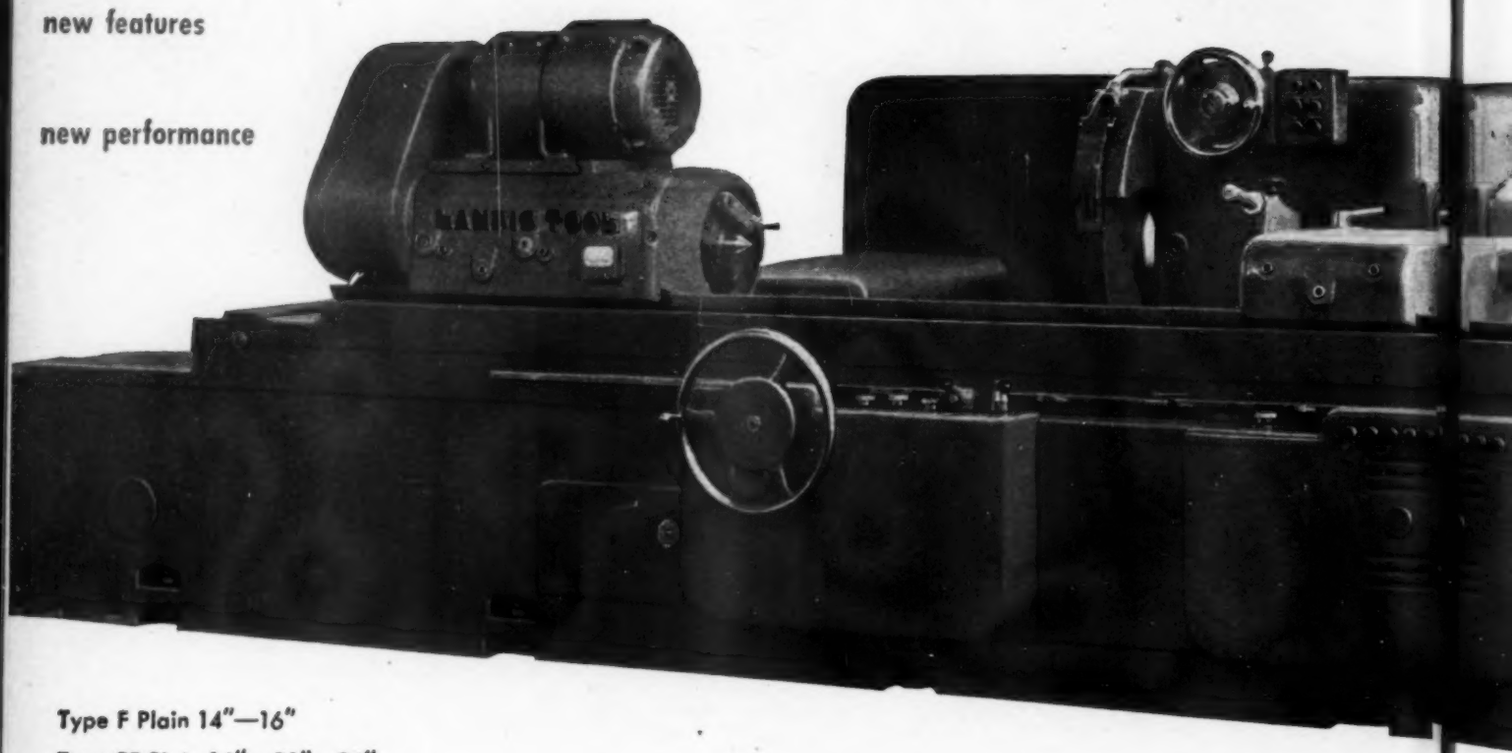
Announcing

a NEW LANDIS TOOL plain hydraulic

new design

new features

new performance

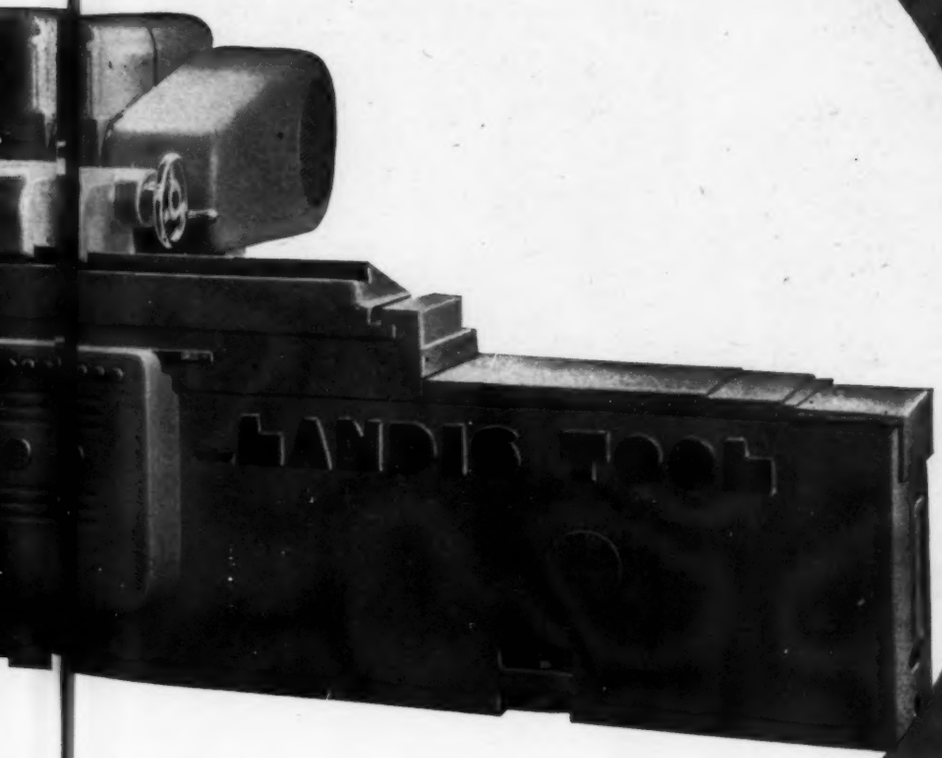


Type F Plain 14"—16"
Type FF Plain 16"—20"—24"
Type FR Roll 16"—20"—24"

LANDIS TOOL
Precision Grinders

grinder

EQUIPPED WITH MICROSPHERE BEARINGS



CONVENIENT OPERATING CONTROLS

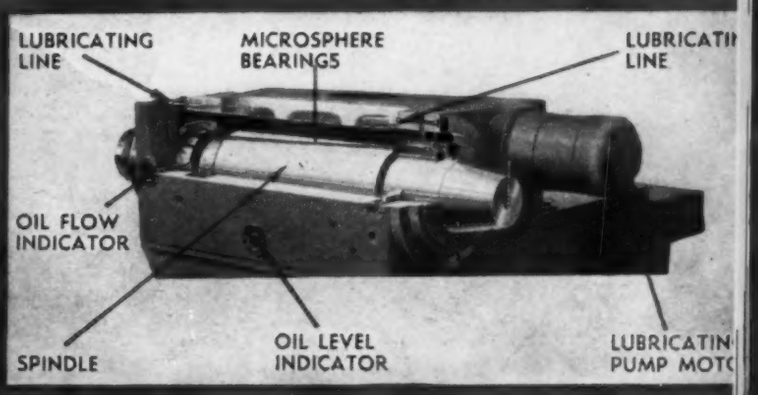
summary of features

standard features

- All Controls Convenient for Operator
- Hydraulic Work Traverse
- Headstock Driven by Adjustable Speed Motor
- Convenient Coolant Reservoir Cleanout
- Telescoping Guide Covers
- Sensitive Taper Adjustment to Swivel Table
- Electric Motors and Controls Built-in

optional features

- Headstock Spindle Speed Indicator
- Hydraulic Rapid Infeed
- Rapid Electric Traverse Wheel Base Movement
- Gapped for Piston Rod Grinding
- Wheel Spindle Speed Indicator



PRESSURE LUBRICATED MICROSPHERE SPINDLE BEARINGS

LANDIS TOOL COMPANY

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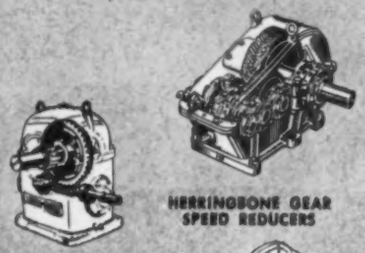
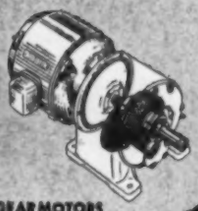
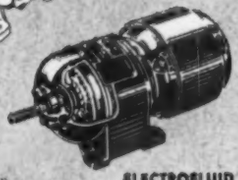
THE COMPLETE LINE OF LINK-BELT POWER TRANSMISSION MACHINERY


HERRINGBONE GEAR SPEED REDUCERS

WORM GEAR SPEED REDUCERS

HELICAL GEAR SPEED REDUCERS


GEARMOTORS


ELECTROFLUID DRIVES

P.I.V. GEAR SPEED VARIATORS

SILVERLINK ROLLER CHAIN DRIVES

SILENT CHAIN DRIVES

STEEL AND MALLEABLE CHAIN DRIVES

V-BELT DRIVES

UNMOUNTED BALL AND ROLLER BEARING UNITS

ROLLER BEARING MOUNTED UNITS

BALL BEARING MOUNTED UNITS

BABBITTED BEARINGS

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Wherever precise speed is a factor in any manufacturing process, the unique P.I.V. Gear speed variator gives outstanding satisfaction.

With this unit, power is transmitted positively through an all-metal chain, making tooth-to-tooth contact with metal wheels. Speeds can be varied infinitely within range of the unit and once selected, the chosen speed is maintained accurately. Speed is changed while the drive is running, by a small hand wheel or by automatic or remote control.

For precise speed control in any type of industrial application use the P.I.V. Gear. Built in a wide range of sizes, and types, fully described in Book 1874.

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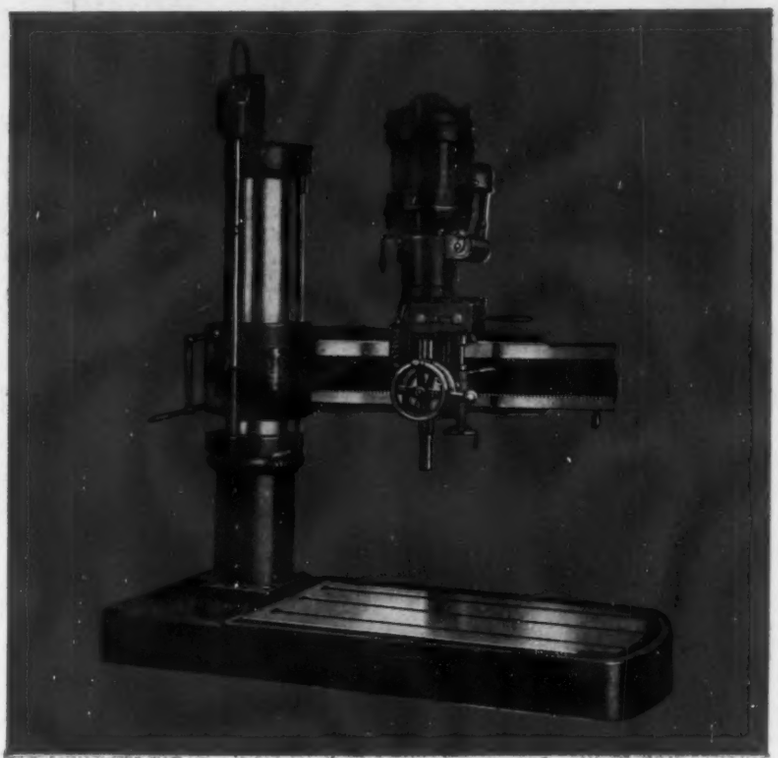
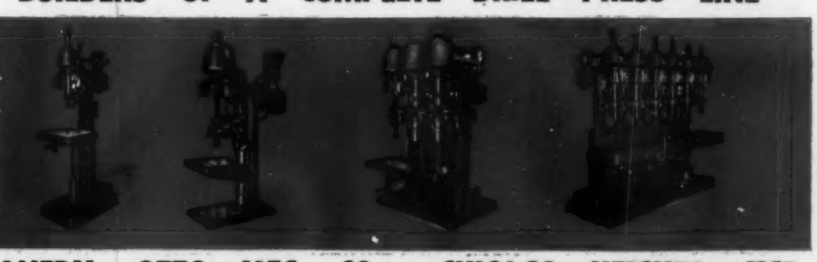
Write for detailed specifications.

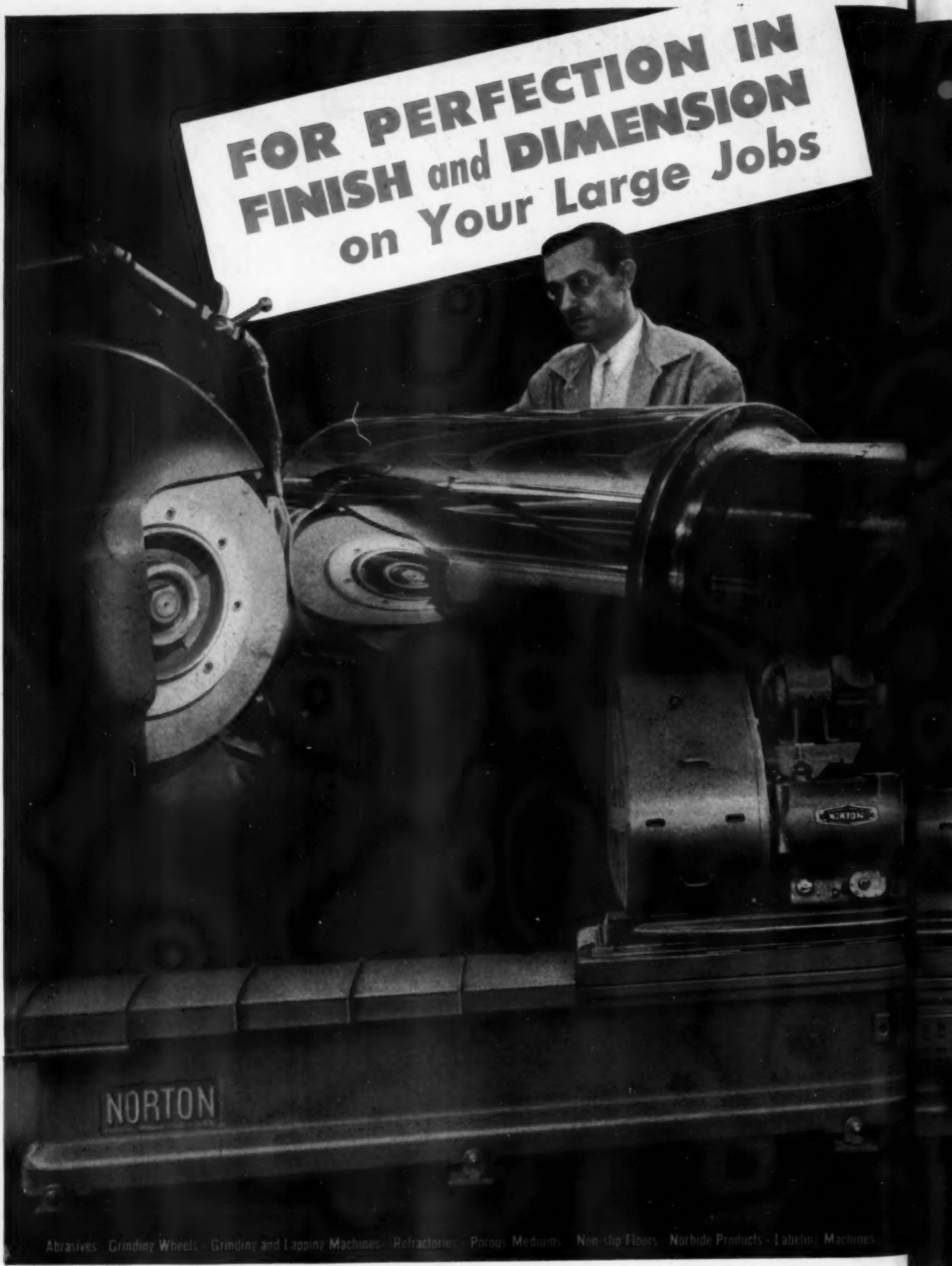


CANEDY-OTTO engineers *specialize* in the design and production of drill presses. We build nothing else. But we do offer the world's most complete drill press line — a faster, more productive, more economical drill press for every drilling need. See us first for your drill press requirements. And when you have a special drilling problem, let a CANEDY-OTTO engineer — a drill press specialist — help you solve it.

BUILDERS OF A COMPLETE DRILL PRESS LINE



CANEDY - OTTO MFG. CO. — CHICAGO HEIGHTS, ILL.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IF you are grinding heavy, large diameter work, you will like the Norton Type D Grinder.

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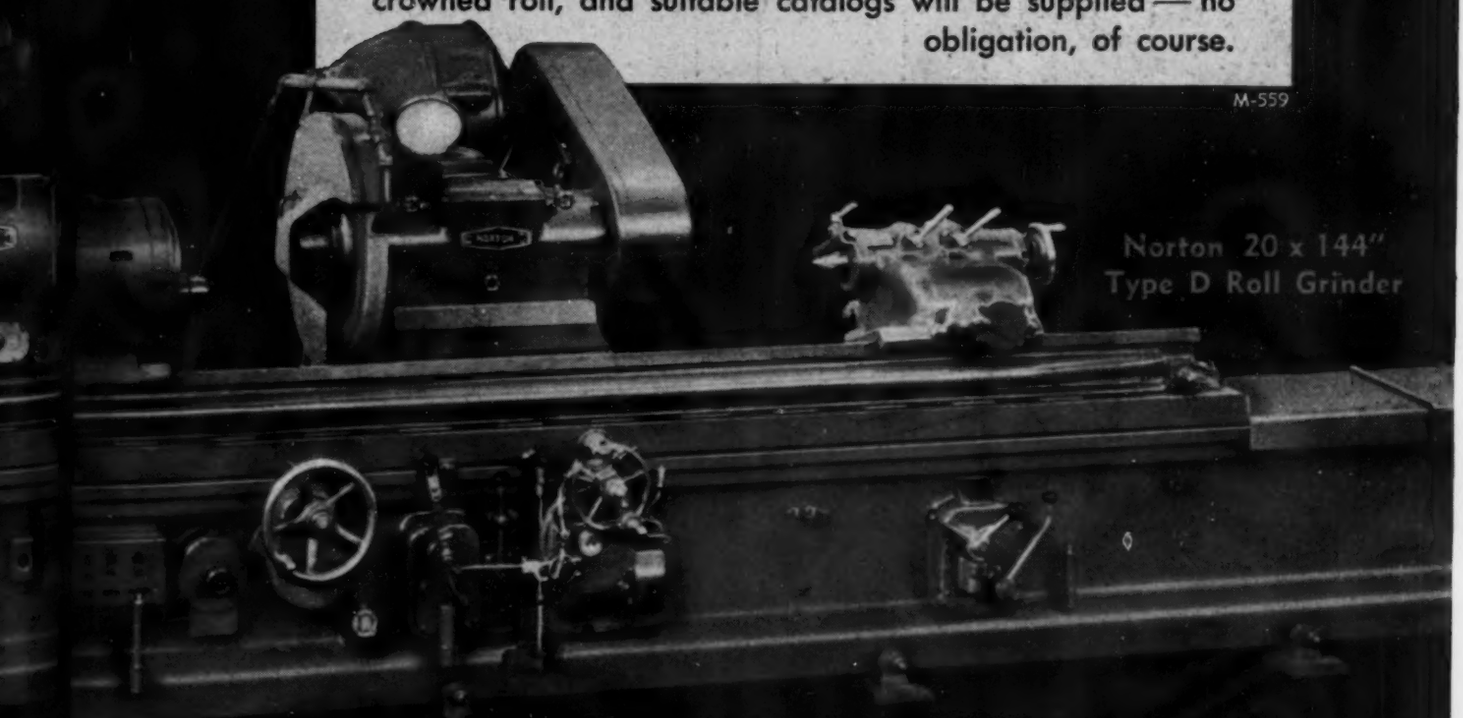
Send us details of your grinding jobs, whether cylindrical or crowned roll, and suitable catalogs will be supplied — no obligation, of course.

M-559



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Have you ever said, "If I can get cutting tools that I can depend on for consistent results and a minimum of hold-ups for reconditioning, I can take care of more production and hold costs in line"?

Many cutting tool users want this same dependability. That's why Barber-Colman Milling Cutters are Job-Engineered . . . to eliminate the factors which cause hold-ups on the production line.

For example, this gang of Barber-Colman Formed Cutters was Job-Engineered to maintain exact form limits on all supercharger rotors milled, and produce the desired rate of production with a good record of tool life. Results showed that reliability of the cutters enabled the manufacturer to devote his time and efforts to taking care of machine, material and personnel factors concerning the job.

In order to provide Job-Engineered Cutters, a complete analysis of the proposed job should be made. Ask your Barber-Colman Representstive to help you estimate your requirements.

Barber-Colman Company

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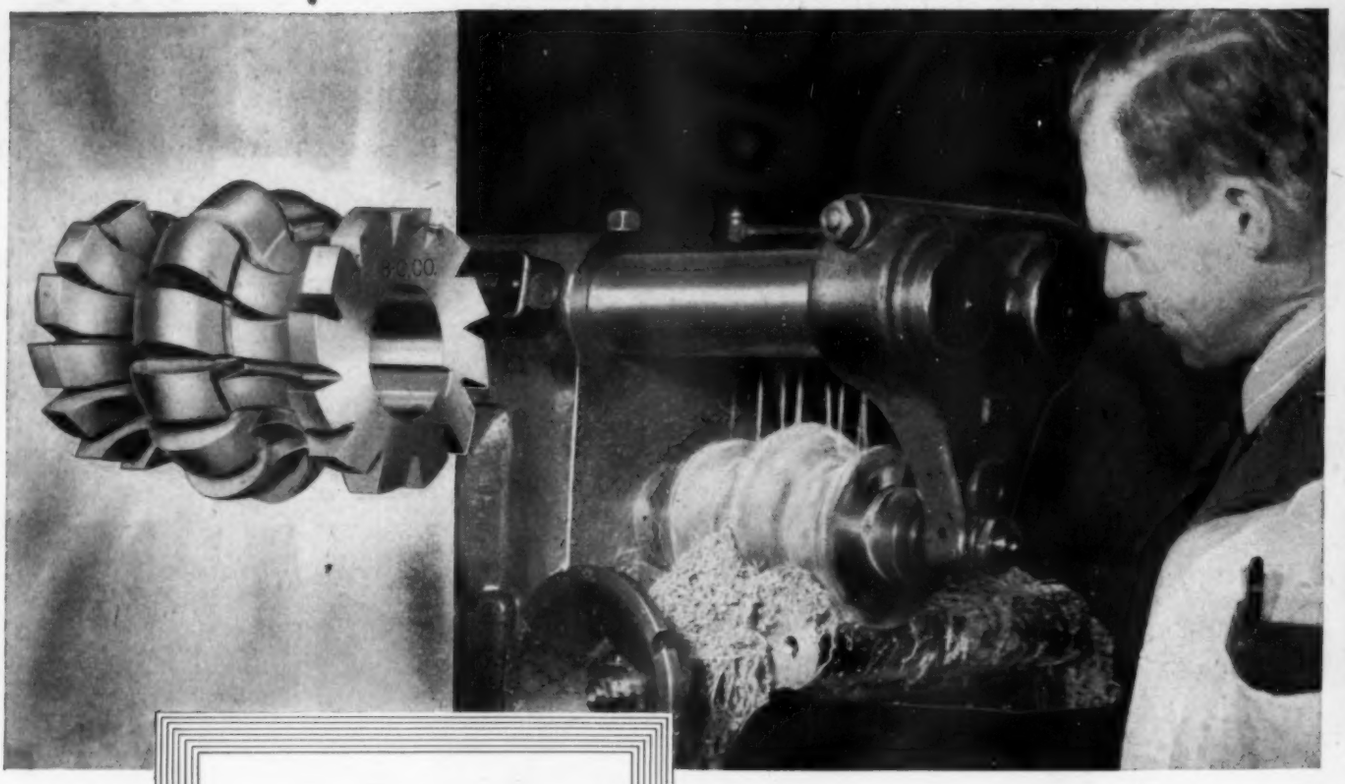


JOB FACTS

Operation — Milling Contour of 3 Lobe Rotor 10" long, 1/3 total surface at each indexing. Surface is first roughed, then finished, using same cutter.

Material — Aluminum Alloy

Stock Removed — 3/32" total in two cuts.

Feed — .005"/rev. Speed — 300 RPM

Floor-to-Floor — 30 min.

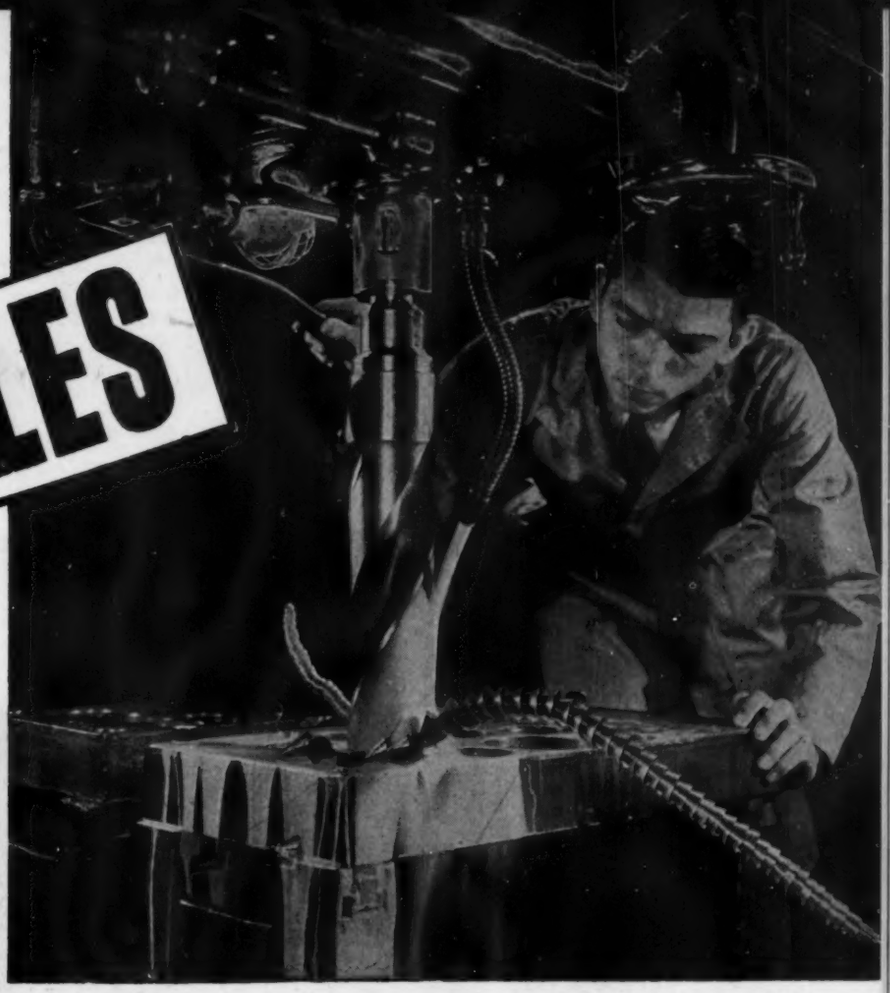
Tool Life — 50 complete rotors per sharpening.

Accuracy — Form matches so that a perfect circle is maintained on each lobe at a radius of 1.160".

BARBER COLMAN

MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

BIG HOLES



LITTLE HOLES

It makes no difference — there's an "AMERICAN" for every job.

"AMERICAN" Hole Wizard Radials are meeting the challenge of intensive production without a whimper. Day in and day out in the production shops throughout the country they are drilling, boring and tapping at top speed and at the same time maintaining amazing standards of accuracy.

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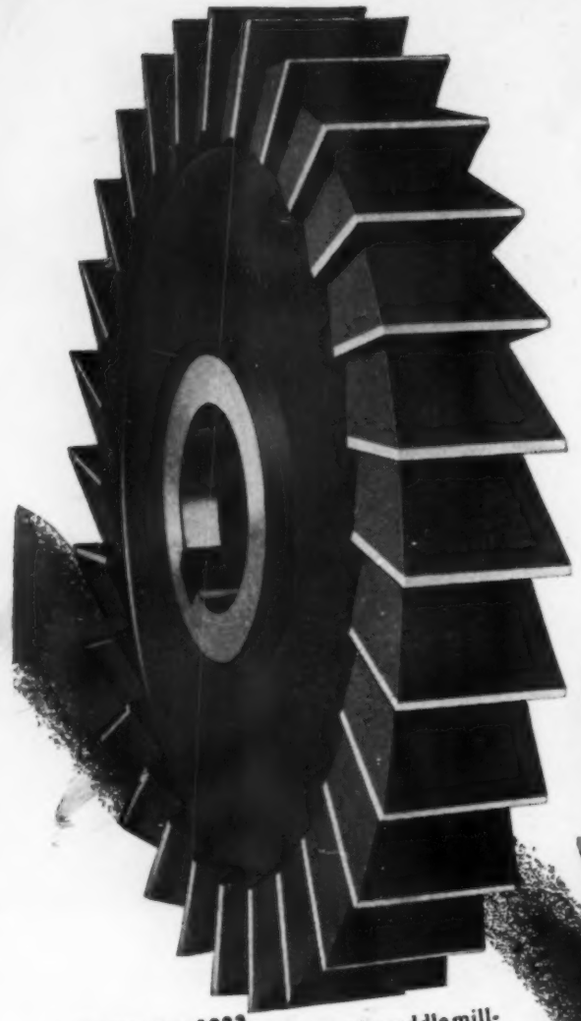
Lathes and Radial Drills

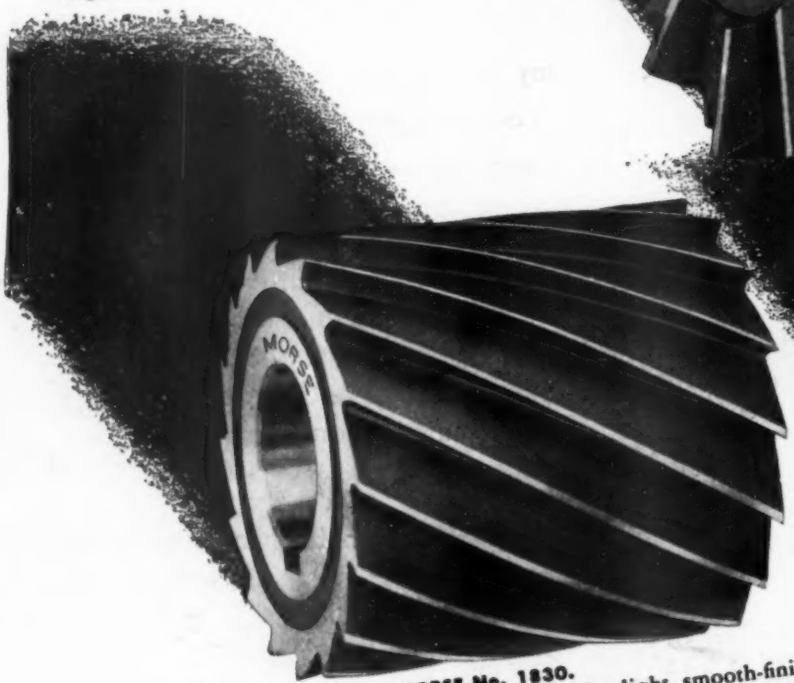
MORSE

that

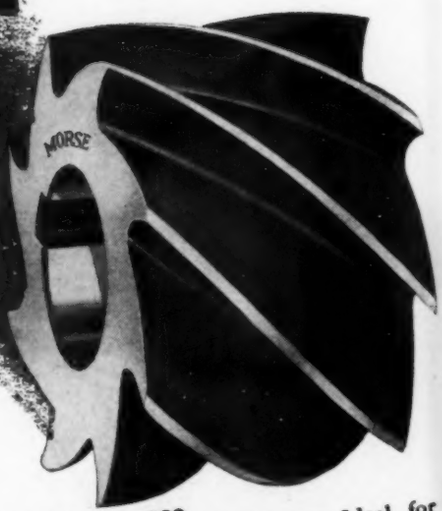


MORSE No. 1833.
Side Milling Cutter—For general straddle milling, slotting, and side milling.

MORSE No. 1809.
Alternate Tooth Side Milling Cutter—For deep slotting, keyway, and heavy-duty milling. Teeth of alternate right and left hand spiral provide shearing action and eliminate side thrust. Cutting action is smooth and rapid.



MORSE No. 1830.
Plain Milling Cutter—For light, smooth-finish cuts in cast iron, malleable iron, and steel. For slabbing work which is narrower than the cutter.



MORSE No. 1802.
Heavy-Duty Plain Milling Cutter—Ideal for heavy cuts where considerable stock is to be removed.

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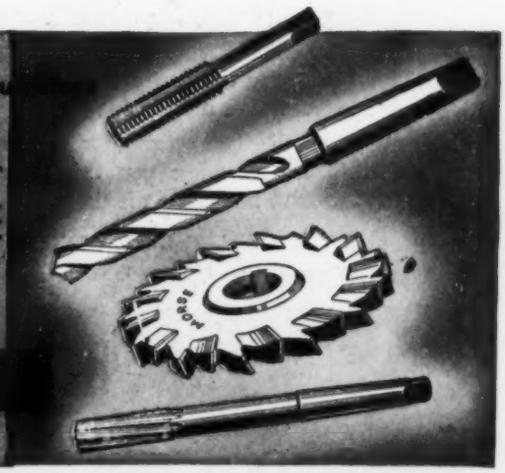

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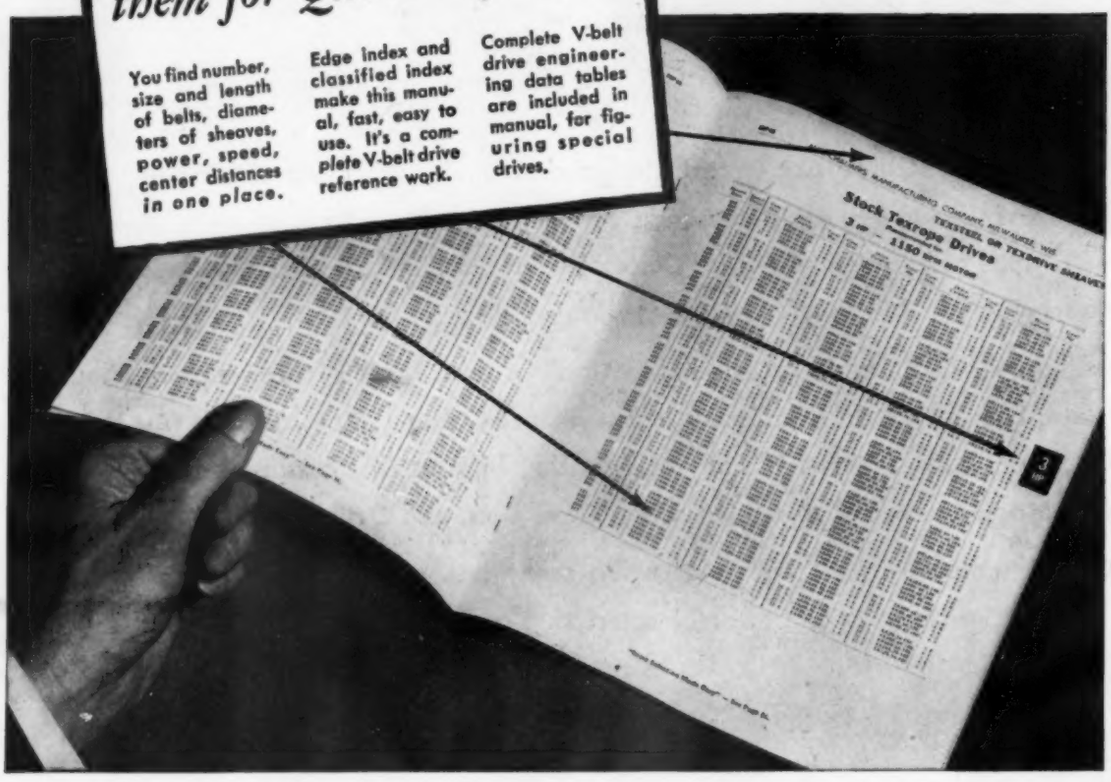
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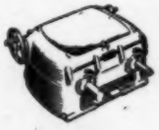

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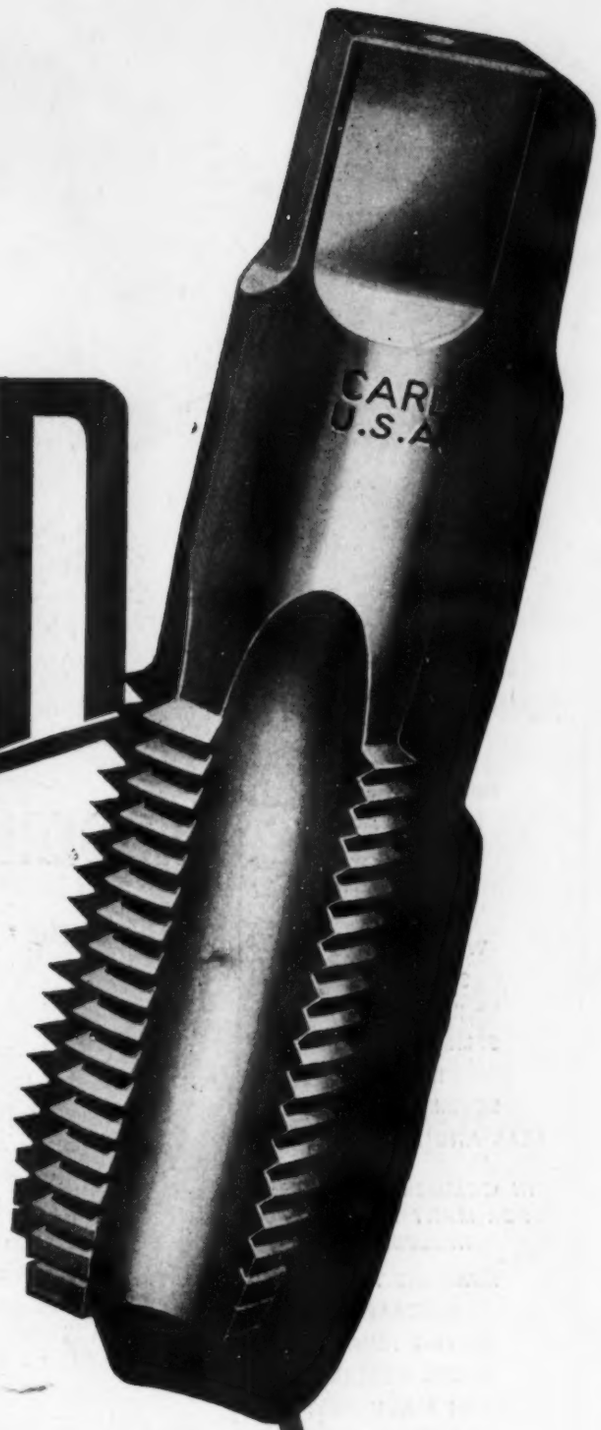

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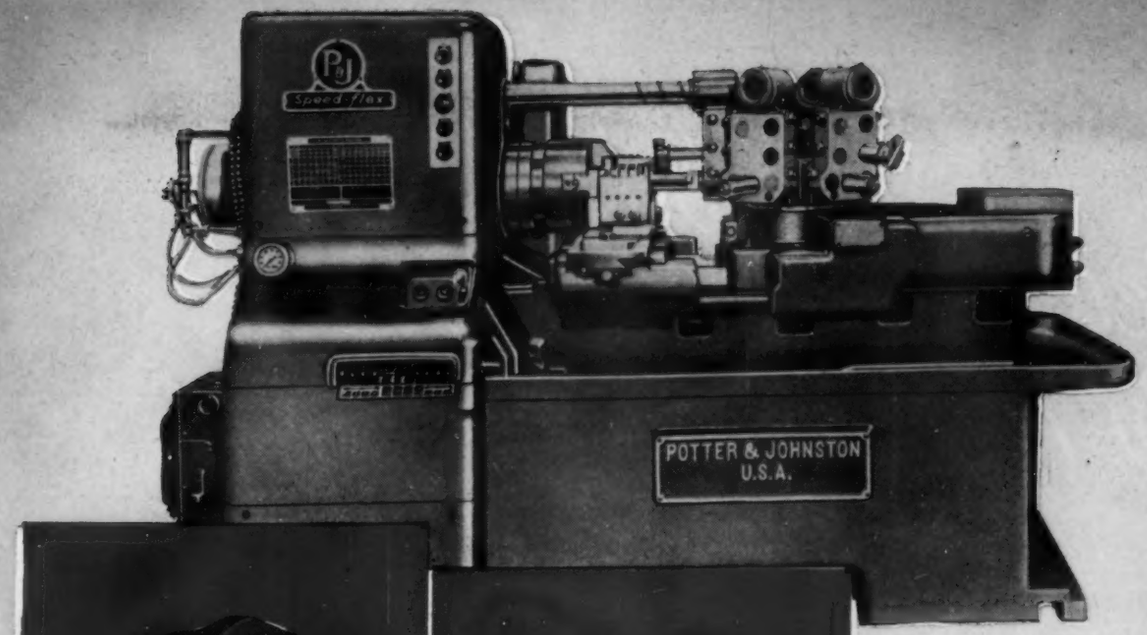
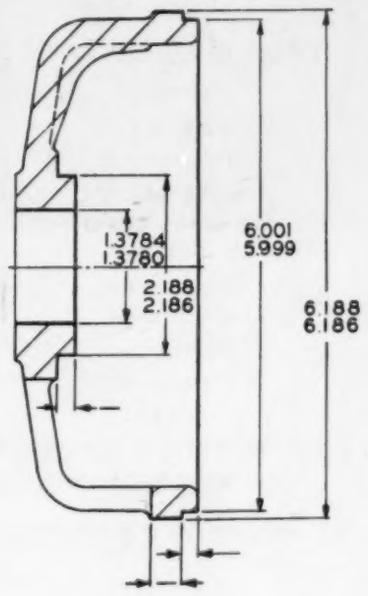
Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883





Automatic operation—high spindle speeds and minimum non-cutting time contribute to fast production...on the

NEW P&J 3U SPEED-FLEX

FLOOR-TO-FLOOR TIME—2.06 MINUTES
PIECES PER HOUR—29

This new Automatic Turret Lathe was developed by P&J engineers to provide a machine which would assure high output of small parts at low cost per piece. The job shown here—a cast iron end shield—is a typical example of how these objectives are attained on the 3U SPEED-FLEX.

Split-second changes in feed and speeds under electro-pneumatic control and close accurate setting of dogs attached to control drums reduce the non-cutting portion of the machine cycle to a minimum. Ample power and rigidity are provided to take full advantage of carbide cutting tools.

A study of how this job is handled may suggest how you, too, can step up the production of your small parts. In any event, consult P&J engineers on your problem and ask them to submit suggestions for handling your duplicate parts on a P&J machine.

DETAILS OF JOB

Part: End Shield

Material: Cast Iron

Method and Operation: Presenting closed end to spindle grip on 1⅜" radius with 3 jaws; position against jaws at rim.

Machine as follows:

1st T.F.: Bore holes; turn and face 6.000"-6.187" dia.; turn and face 2.187" dia.; face 2¾" dia. shoulder.

2nd T.F.: Finish the above.

3rd T.F.: Blank.

4th T.F.: Size turn 6.000"-6.187" dia.; turn 2.187" dia.

5th T.F.: Blank.

6th T.F.: Blank.

Allow for diamond boring in hole.

POTTER & JOHNSTON MACHINE CO.

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, RHODE ISLAND

The DeVlieg JIGMIL is now recognized as The World's Leader in the field of accurate boring, in addition to its unique capacity for high productivity on:

1. **Single part precision boring.**
2. **Tool, jig and die work.**
3. **Repetitive production work without jigs.**

Write today for new descriptive booklet.

DEVLIEG JIGMIL

DeVLIEG MACHINE COMPANY

450 FAIR AVE., FERNDALE 20, (DETROIT) MICH.

Sheldon Machine Co. uses Timken® bearings for higher speeds and greater accuracy

FOR higher machining speeds, extreme accuracy and lower production costs, Sheldon Machine Co. equips the spindle of its new TRB S-56 precision lathe with zero precision Timken tapered roller bearings.

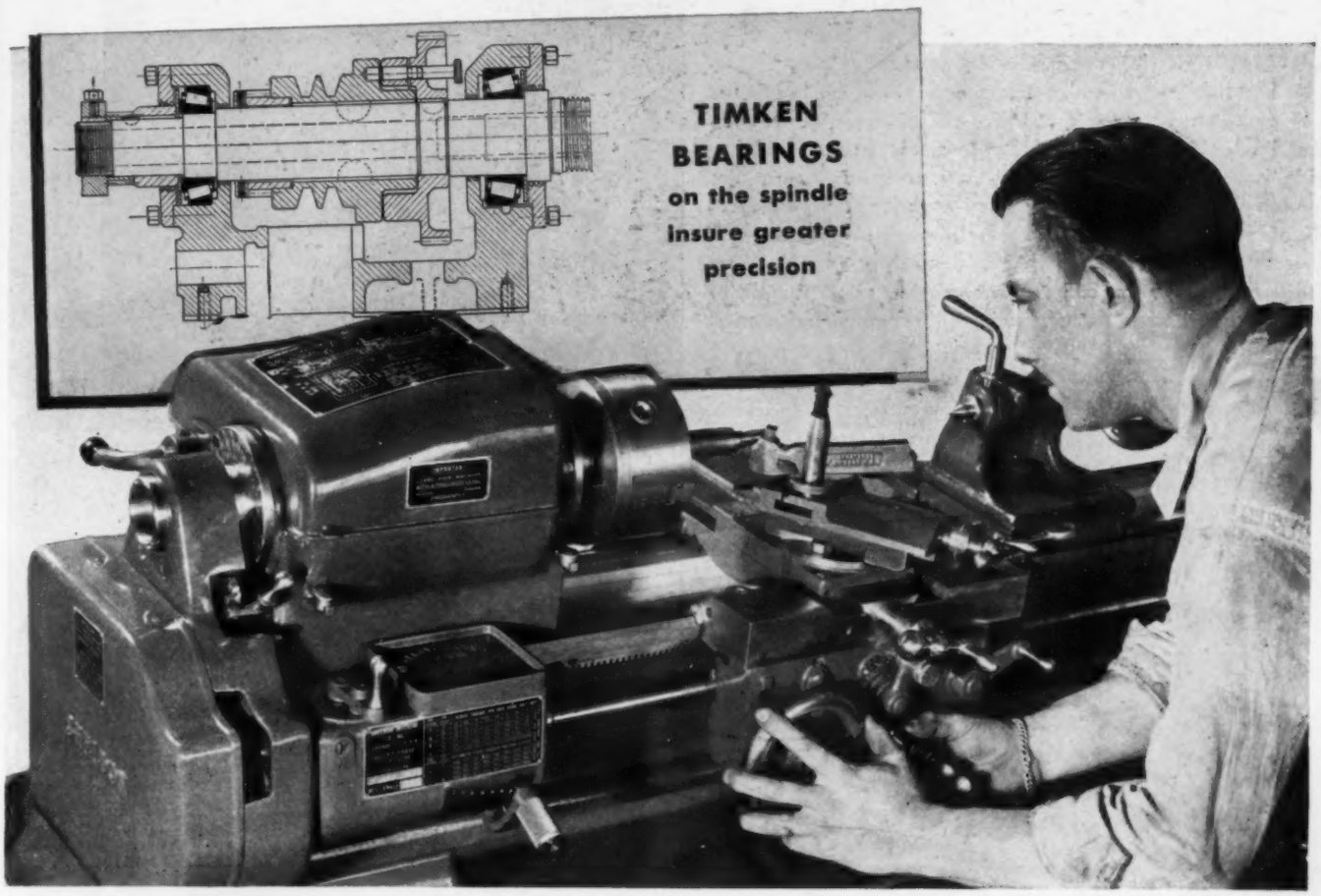
Timken roller bearings hold spindles rigid, yet free to rotate easily. Due to the line contact between the rolls and races, the spindle is firmly supported—no chance of deflection. Because of tapered construction and provision for take-up in assembly, there is no possibility of end-movement. And the true-rolling motion and incredibly smooth surfaces of Timken bearings practically eliminate friction.

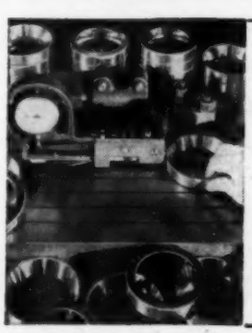
Made of Timken fine alloy steel, Timken bearings are selected to last the life of the machine. Bearing wear is negligible; spindles *keep* their precision for long years of service.

No other bearing can give you *all* the advantages you get with Timken bearings—backed by 49 years of research and development. Make sure the trade-mark "Timken" is on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.





WITHIN ONE HALF A THOUSANDTH OF AN INCH!

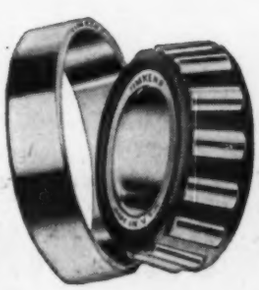
. . . that's an example of the accuracy demanded in the outside diameter of Timken bearing cups in order to pass inspection.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

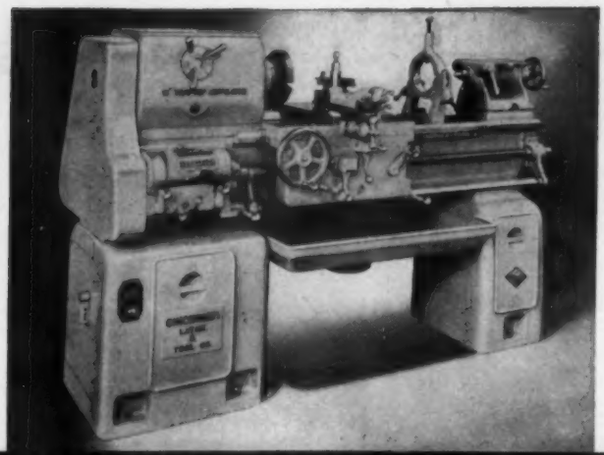
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



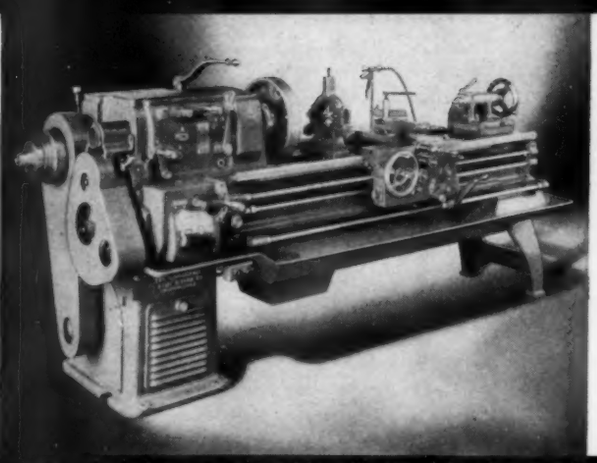
NOT JUST A BALL ○ NOT JUST A ROLLER ▬ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ◫ AND THRUST ◫→ LOADS OR ANY COMBINATION ✳



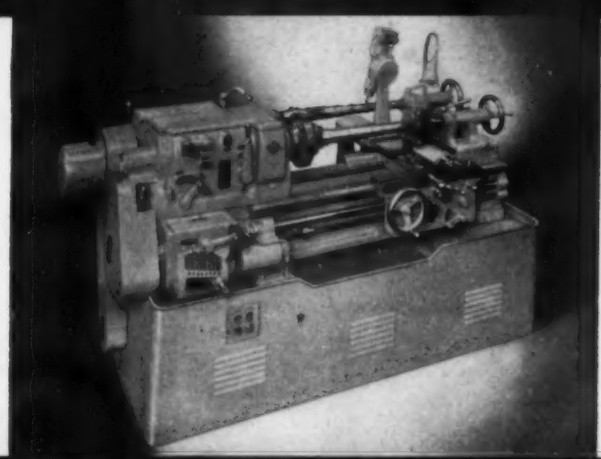
NEW TRAY TOP CINTILATHE, a light duty, low cost motor driven geared head engine lathe, offers features not usually included in lathes of their size and price range. Built in 10″, 12½″, 15″, and 18″ swing sizes, and distances between centers from 18″ to 60″, 12 spindle speeds, with an overall ratio of 41 to 1, 48 thread and feed changes . . . Standard Motor Drive 10″—1 HP., 12½″—1½ HP., 15″—2 HP., 18″—3 HP . . . Tray Top Cintilathes in 15″ and 18″ sizes available with gap, including gap block.

exceptional features at lowest cost

STANDARD CINTILATHES in six nominal swings 14″ to 24″, bed lengths providing distances between centers from 32″ to 238″, 12 spindle speeds—32 changes of threads and feeds. These medium duty low cost lathes handle a wide variety of turning, boring, and threading operations for long or short runs. They offer capacity for practically all of your lathe work with a minimum investment. All sizes may be furnished with gap, including gap block. A profit maker for general machine shops, small manufacturing plants, and maintenance and repair departments.



capacity for practically all your lathe work



NEW CONTOURMATIC CINTILATHE with feather-touch tracer control, turns multiple diameter shafts in small or medium production lots, automatically, accurately, and economically, and retains the full versatility of a standard engine lathe . . . Two machines in one. "Mike" once and all dimensions come true. Sensitive all hydraulic tracer control provides automatic duplication of master shape with high degree of accuracy. Supplied in same sizes as standard Cintilathes.

two machines in one, with feather-touch tracer control

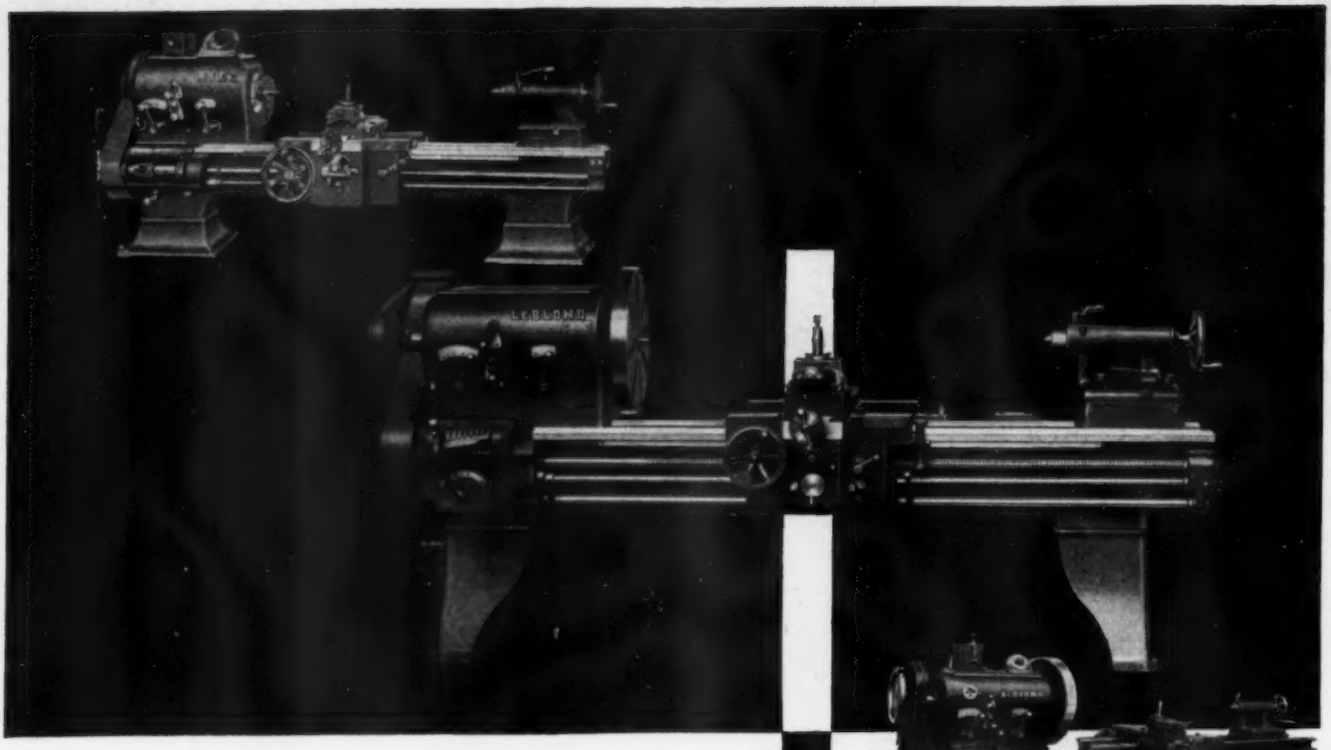
NEW TRACERMATIC CINTILATHE is a special machine for use primarily on molds for bottles, tableware and other items in glass industry, embossing dies, dies for plastics, etc., where extreme accuracy, fineness of detail, and speed of production are required. The work need not be circular in cross section. Ovals, squares, rectangles, etc., with rounded corners and intricate patterns are readily produced.

WRITE FOR LATEST CATALOGS AND PRICES

CINCINNATI LATHE & TOOL CO.

OAKLEY, CINCINNATI 9, OHIO • CABLE ADDRESS: CINTILATHE

IN CANADA: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3. IN ENGLAND: Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.



there's a Le Blond Regal for your turning requirement . . .

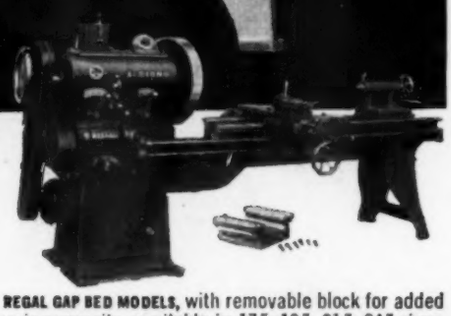
SIX SWING SIZES, MANY TYPES

In the broad LeBlond Regal line of seven standard engine lathes from 13" to 24", a bench model, four gap bed models, four turret models, and a wide variety of productive attachments including the new electric duplicator, you'll find just the lathe for your shop. LeBlond Regals are low in cost. High in their ability to turn efficiently and accurately all kinds of metal, plastic, and rubber. Widely used for tool room, training, experimental, production or maintenance work. Wherever a versatile, low-cost light pattern lathe is required, use Regal . . . for Regal's a better buy.

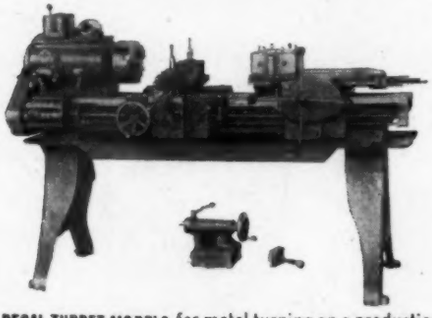
send for your free illustrated bulletins today.

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

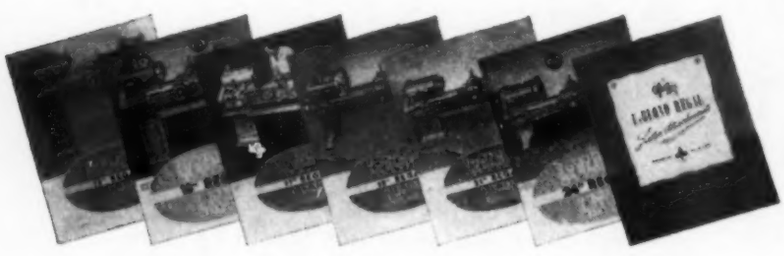


REGAL GAP BED MODELS, with removable block for added swing capacity, available in 17", 19", 21", 24" sizes.

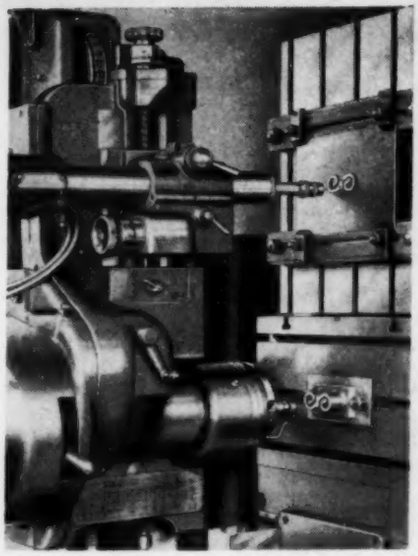


REGAL TURRET MODELS, for metal turning on a production basis, available in 13", 15", 17", 19" sizes.

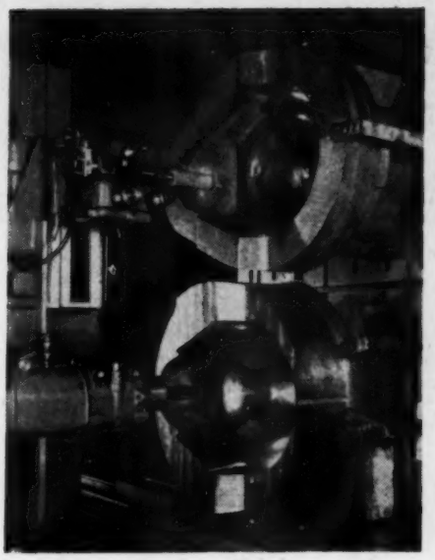
NEW ELECTRIC DUPLICATOR, for automatic shaft duplicating and profile facing, available for all LeBlond Regals and Dual Drives.



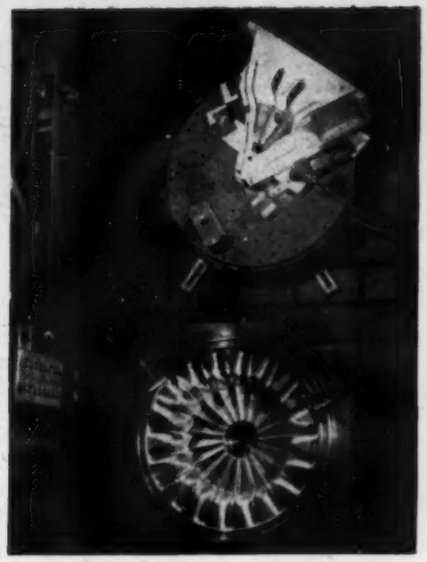
LEBLOND



Profiling the punch for blanking a tiny manganese bronze flat spring from a sheet metal template. Punch, die and stripper were milled on the same machine. This is typical of two-dimensional Kellering, jobs ranging upwards from this small one.

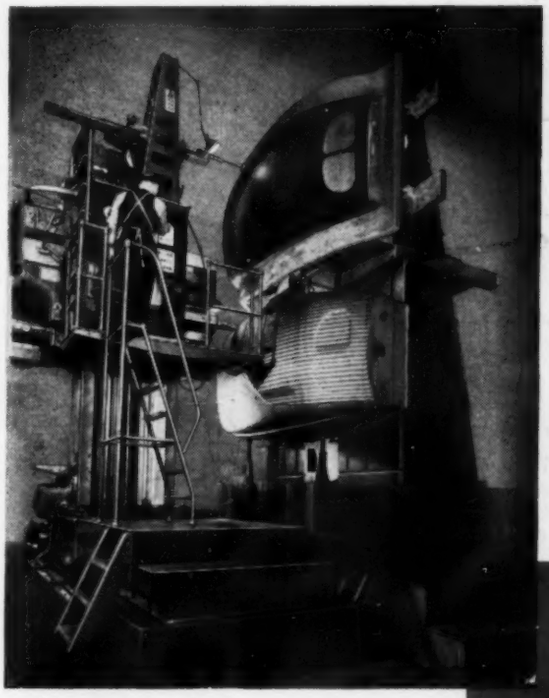


This will be a permanent mold for the precision casting of aluminum power-lawnmower housings. The three-dimensional master shown here is made of wood; Kellering can also be done with masters of plaster, or any other easily worked material.



This would be difficult and complex without a Keller—milling a forging die for a jet engine impeller. Tracer-controlled milling faithfully reproduces the three-dimensional partial model in each successive index position, to produce a perfect completed die.

Has everybody here seen Keller?



The largest of the Kellers, Type BG-3, is finish-cutting (after roughing out) a huge die for an automobile roof panel, tracing a master cast made from the final approved mock-up. It required Kellering to make large dies like this possible and practical. Without Kellering, modern streamlined cars would not exist.

Picture a machine with an extremely delicate sense of touch . . . one that can trace every contour of an intricate model or master — and deftly translate it into tough metal — automatically, accurately, economically.

That's Keller at work. Versatile, dependable, productive — it can save you time and money regardless of the complexity of your die or mold making problems, in both machining and finishing stages.

Tracer-controlled milling or "Kellering" is the accepted modern method of creating dies and molds rapidly at least cost. One or more of the seven sizes of Keller machines (which can be arranged to give 14 work capacities) will meet your needs, whether they be for die-casting dies, forging dies, or plastic molds. Write for literature. Pratt & Whitney, *Div.* Niles-Bement-Pond Company, West Hartford 1, Conn.

Pratt & Whitney
Keller Machines

Tracer-Controlled Milling automatically reproduces, in tough alloysteel, both two- and three-dimensional master shapes.

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Helicopters made by Bell Aircraft were recently used to spray swarms of flying locusts in South America. A 98% kill was reported.

get ready with CONE for tomorrow

The Naval Research Laboratories are "growing" artificial quartz crystals for use in electronic devices.

be ready with CONE for today

The U. S. Bureau of Standards has developed a method of plating with nickel or cobalt that requires no electric current.

get ready with CONE for tomorrow

A magnified chart showing the shape, height and spacing of long waves, steps, fine roughness and other irregularities on machined or finished surfaces is provided by the Proficorder — a new Physicists Research Co. shop instrument.

be ready with CONE for today

Air speeds up to 7,000 miles per hour can be simulated for study by towing models at much slower speeds in a shallow tank of water. The method is in use in North American Aviation's Aerophysics Laboratory.

get ready with CONE for tomorrow

Goodyear Tire and Rubber Co. cements automobile brake linings directly to the brake shoes eliminating rivets. More surface is provided and longer wear without scoring results.

be ready with CONE for today

Fibrous insulation composed of pure silica and capable of withstanding 2,000 deg. F. is being made by H. I. Thompson Co. of Los Angeles.

get ready with CONE for tomorrow

Photographic prints produced in a specially equipped automobile immediately after exposure were transmitted by radio to the editor's desk at the NEW YORK DAILY MIRROR eight minutes after the event pictured.

American-La France-Foamite Corp. is making a two-car parking meter which halves the cost of installation.

be ready with CONE for today

Color printing by radio facsimile is now possible with a process called "Colorfax" developed by Finch Telecommunications Inc.

get ready with CONE for tomorrow

The underground gassification of coal for the commercial production of power has been proved feasible by the Alabama Power Co.

be ready with CONE for today

The Automatic Signal Division of Eastern Industries, Inc. has a device for measuring the speed of vehicles in traffic that is based on the reflection of a radio wave from the surface of a moving vehicle.

Pennsylvania Railroad is using a mobile X-ray machine to examine metals in locomotives, cars, rails and other equipment.

get ready with CONE for tomorrow

In California the Bakersfield Machine Co. sells welders' supplies directly from a truck to oil fields, farmers, factories and welding shops.

be ready with CONE for today

American Locomotive Co. has a waste-heat boiler that operates on diesel engine exhaust.

get ready with CONE for tomorrow

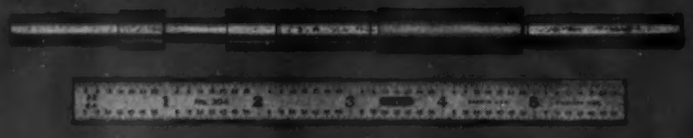
A small air-driven drill made by Aro Equipment Corp. has a ¼-inch chuck and turns 26,000 r.p.m.

be ready with CONE for today

Fruehauf Trailer Co. is making prefabricated truck bodies that can be assembled by the dealer in a few hours.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

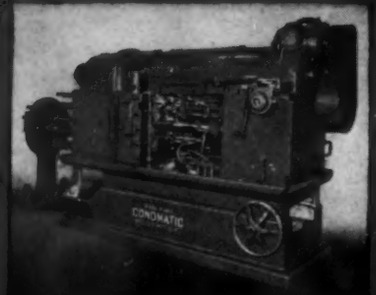
Can YOU equal this



in 12 seconds?

The above shaft was machined by a 1⅜" 8-Spindle Conomatic in 12 secs., with 16 tools, from SAE 1030 — ½" rd. stock.

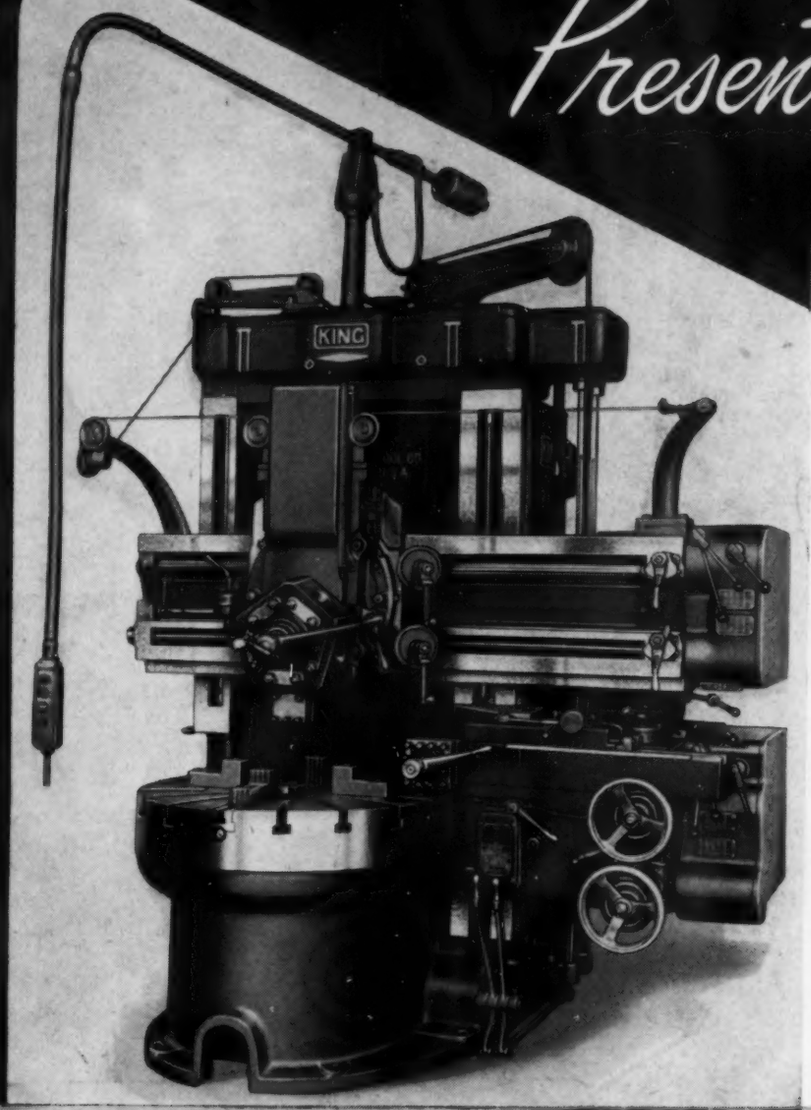
Ask your CONE representative to show you our new color motion picture



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

Presenting the...



New Series
KING
42-INCH VERTICAL BORING and TURNING MACHINE

● This King 42 inch New Series Machine is of heavier, more rigid construction throughout and particularly adapted to the use of carbide tools . . . It has more power—a wider range of feeds and speeds—and operating controls conveniently located at the front of the machine . . . Everything as to design and construction points to greater accuracy plus the maximum of production at lowest possible costs . . . Consult a King Engineer on your precision boring and turning operations.

American Steel Foundries

KING MACHINE TOOL DIV.
CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines and Sebastian Lathes

CUT SET-UP TIME UP TO 50%

Kearney & Trecker Announces One of the Most Important Developments Ever Made in Milling Machine Design—the Built-In Chuck-Type Table

HOW would you like to have a quick-loading, work-holding fixture tailor-made for every job? This new Kearney & Trecker development amounts to just that! It's specifically designed to simplify milling job set-ups and to reduce excess material handling and set-up time.

Yes! This new *built-in* Chuck-Type Table quickly handles simple run-of-the-shop jobs . . . and just as readily adapts itself to handle unusual or hard-to-hold workpieces. In actual tests, workpieces, both large and small, simple and complex, have been set-up and machined in fractions of the time formerly required.

Equally important, the extra-close limits to which these tables are machined give you greater set-up accuracy and greater set-up rigidity — that means better results on every job!

The *built-in* Chuck-Type Table is available now in three standard working ranges on the following Kearney & Trecker standard knee-type milling machines, plain or vertical styles: (1) 34″ power table feed — Models 2K, 3H and 20 CSM. (2) 42″ power table feed — Models 3K, 4H and 30 CSM. (3) 50″ power table feed—Models 4K, 5H and 50 CSM.

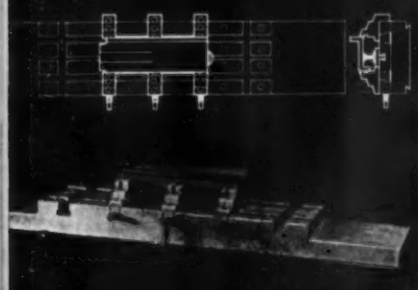
Accessories include screw and spring jacks, bumper stops and a variety of interchangeable, reversible vise jaws with hard, soft, plain, serrated, flat or radius faces depending on the surface or material to be clamped. The high speed and flexibility with which these accessories can be adapted to various jobs will amaze you.

If you are planning on new milling machine equipment in your shop—it will pay you to get complete details on the new Kearney & Trecker *built-in* Chuck-Type Table. Contact your nearest Kearney & Trecker Office or Dealer, or write direct to Kearney & Trecker Corporation, 6784 W. National Avenue, Milwaukee 14, Wis.

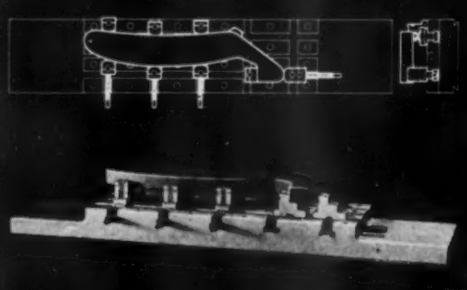
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

SEE THESE EXAMPLES OF HOW TYPICAL SET-UPS ON NEW CHU

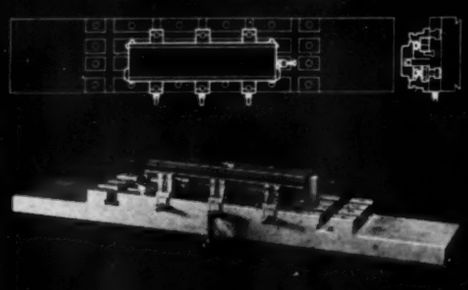
AVERAGE SET-UP TIME: 15 MINUTES



AVERAGE SET-UP TIME: 25 MINUTES

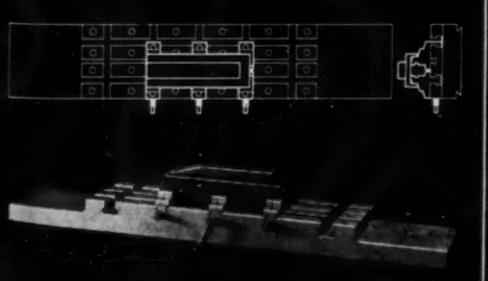


AVERAGE SET-UP TIME: 15 MINUTES

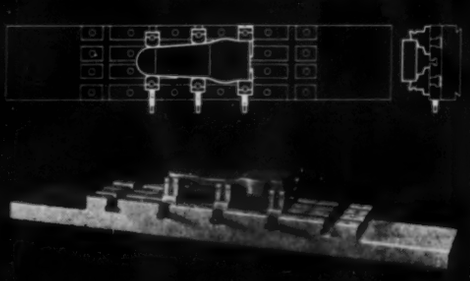


CHUCK-TYPE TABLE SAVE TIME... GIVE GREATER RIGIDITY

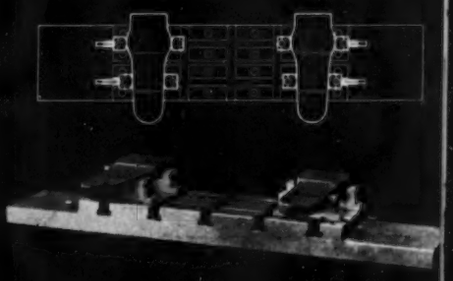
AVERAGE SET-UP TIME: 12 MINUTES



AVERAGE SET-UP TIME: 15 MINUTES

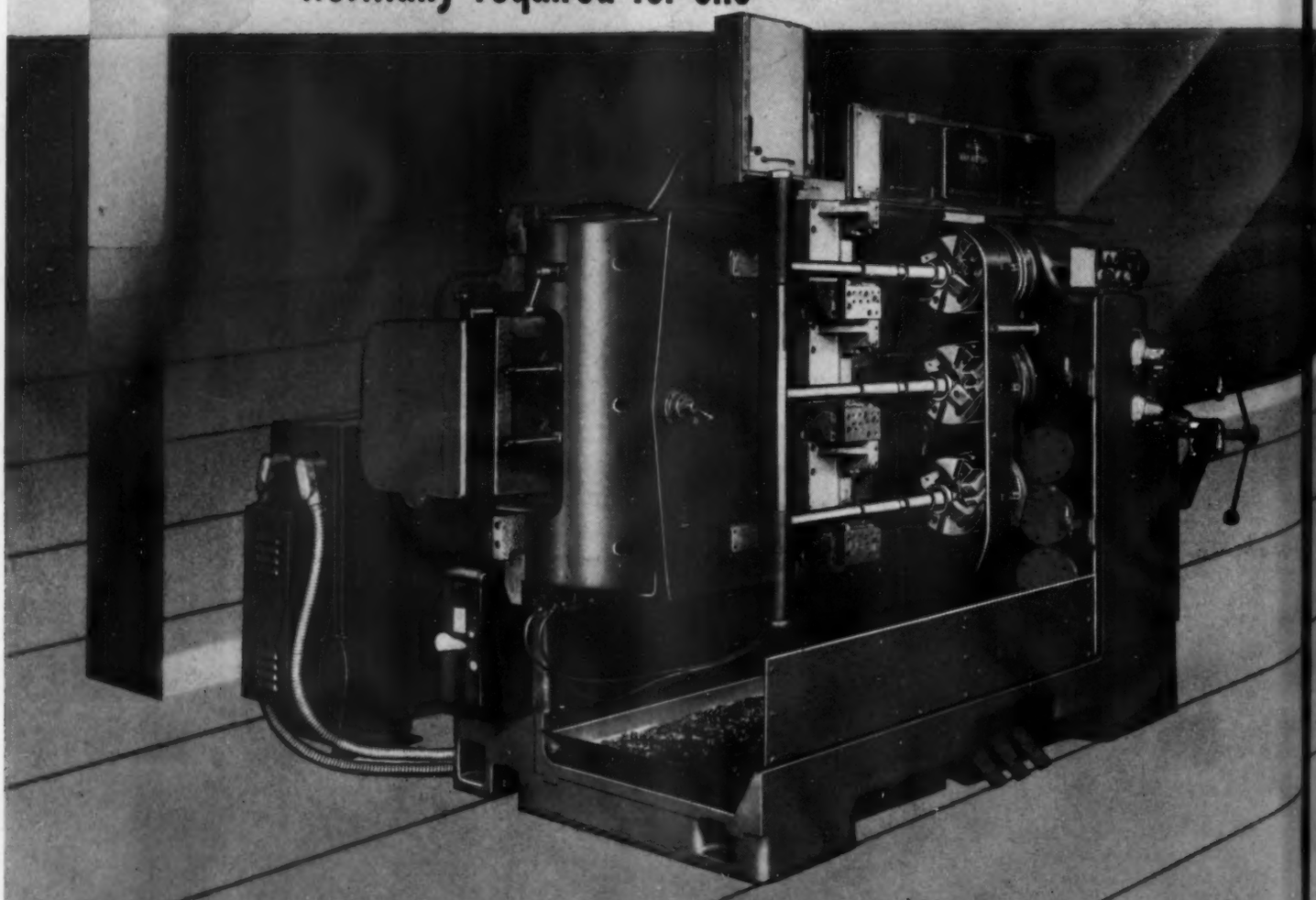


AVERAGE SET-UP TIME: 20 MINUTES

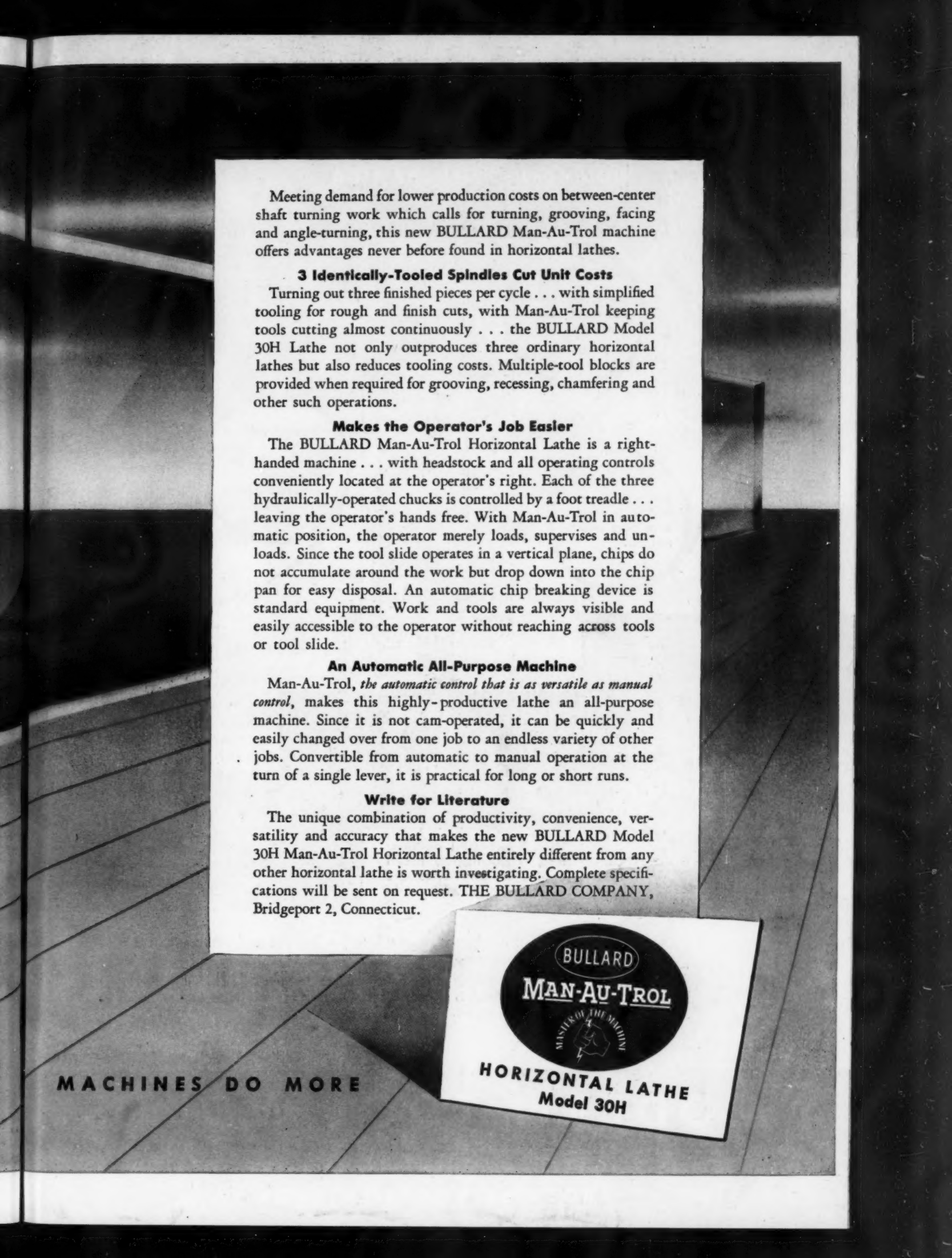


NEW BULLARD METHOD TRIPLES PRODUCTION

Model 30H MAN-AU-TROL Horizontal Lathe produces 3 identical pieces in the time normally required for one



BULLARD CREATES ***NEW METHODS*** TO MAKE



Meeting demand for lower production costs on between-center shaft turning work which calls for turning, grooving, facing and angle-turning, this new BULLARD Man-Au-Trol machine offers advantages never before found in horizontal lathes.

3 Identically-Tooled Spindles Cut Unit Costs

Turning out three finished pieces per cycle . . . with simplified tooling for rough and finish cuts, with Man-Au-Trol keeping tools cutting almost continuously . . . the BULLARD Model 30H Lathe not only outproduces three ordinary horizontal lathes but also reduces tooling costs. Multiple-tool blocks are provided when required for grooving, recessing, chamfering and other such operations.

Makes the Operator's Job Easier

The BULLARD Man-Au-Trol Horizontal Lathe is a right-handed machine . . . with headstock and all operating controls conveniently located at the operator's right. Each of the three hydraulically-operated chucks is controlled by a foot treadle . . . leaving the operator's hands free. With Man-Au-Trol in automatic position, the operator merely loads, supervises and unloads. Since the tool slide operates in a vertical plane, chips do not accumulate around the work but drop down into the chip pan for easy disposal. An automatic chip breaking device is standard equipment. Work and tools are always visible and easily accessible to the operator without reaching across tools or tool slide.

An Automatic All-Purpose Machine

Man-Au-Trol, *the automatic control that is as versatile as manual control*, makes this highly-productive lathe an all-purpose machine. Since it is not cam-operated, it can be quickly and easily changed over from one job to an endless variety of other jobs. Convertible from automatic to manual operation at the turn of a single lever, it is practical for long or short runs.

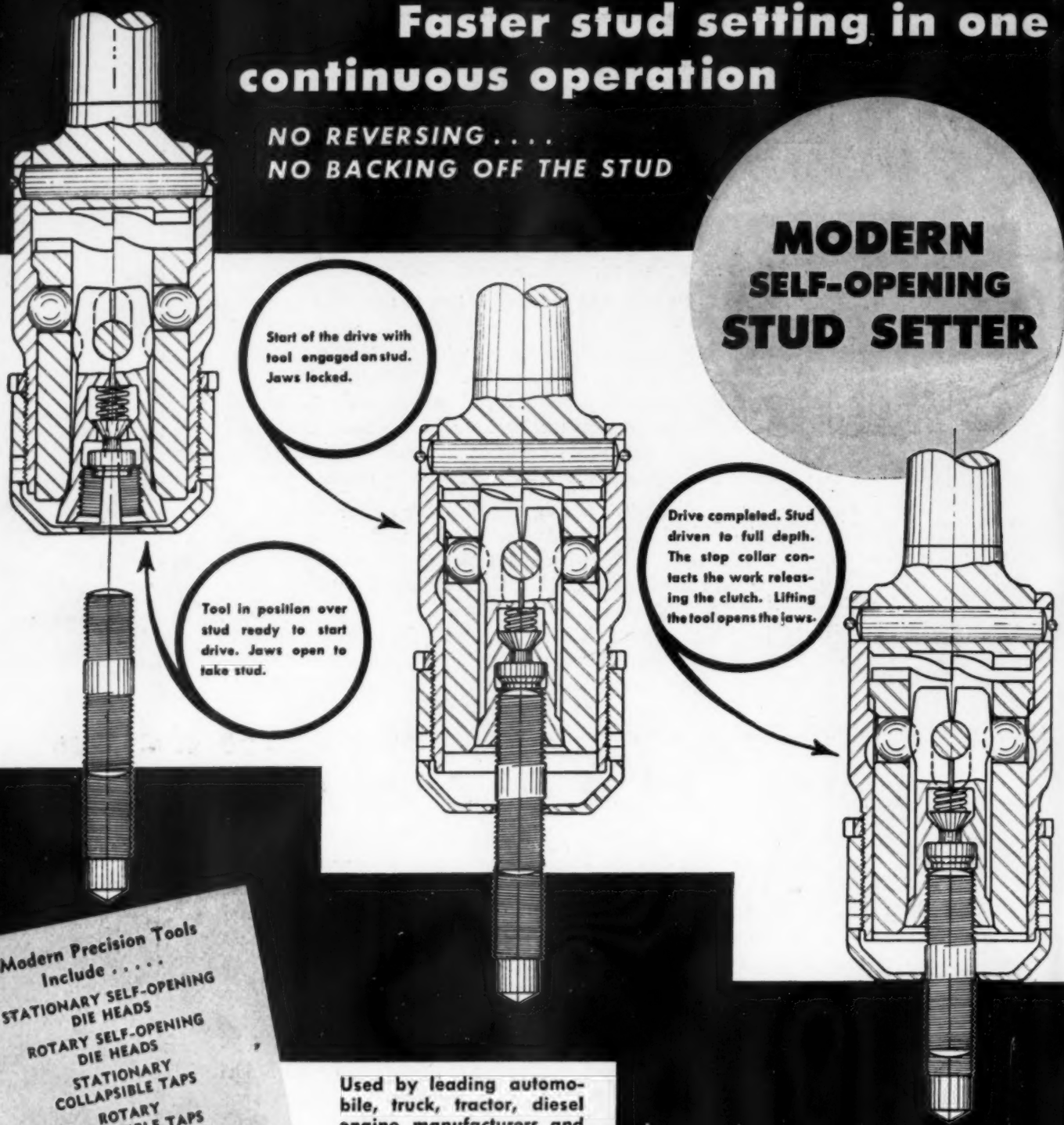
Write for Literature

The unique combination of productivity, convenience, versatility and accuracy that makes the new BULLARD Model 30H Man-Au-Trol Horizontal Lathe entirely different from any other horizontal lathe is worth investigating. Complete specifications will be sent on request. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

Faster stud setting in one continuous operation

NO REVERSING . . . .
NO BACKING OFF THE STUD

MODERN SELF-OPENING STUD SETTER


Start of the drive with tool engaged on stud. Jaws locked.
Drive completed. Stud driven to full depth. The stop collar contacts the work releasing the clutch. Lifting the tool opens the jaws.
Tool in position over stud ready to start drive. Jaws open to take stud.

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Used by leading automobile, truck, tractor, diesel engine manufacturers and others with studs to set in quantity.

As the action of this tool is positive and automatic, it is conveniently operated in any position with either air or electrically operated portable tools. It is also adapted to use in a drill press where it is possible to drill and tap the holes and set studs in successive operations.

For full information, send for Bulletin M-186

MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

NEW SIMOMETER

gives you accurate

TESTED TENSION

in less than 1 minute per blade

Here's how SIMONDS Quick and Easy Tensioning Method gives you LONGER BLADE LIFE!

Avoid Undertension which causes crooked cutting, spoiled work, lost time.

Avoid Overtension which causes blade-vibration, rapid dulling of teeth, frequent blade-breakage.

Slip the *Simometer* Directly over Blade, tighten two thumbscrews . . . now put tension on blade until **Simometer** needle moves into green zone . . . and you *can see at a glance* you have the right tension on the blade.

Then You're Set to get Faster, Straighter Cuts... and more cuts per blade... *the full measure* of performance which **SIMONDS** "Red End" Power Blades are made to give you. Ask your distributor.

BRANCH OFFICES: 1550 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 511 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

SIMONDS ALSO MAKES:

FLAT GROUND STEEL STOCK (Oil Hardening)

"RED TANG" FILES

METAL-CUTTING BAND SAWS (Regular Hard Edge, Skip-Tooth, Spring Temper)

CIRCULAR METAL-CUTTING SAWS (Inserted-Tooth, Segmental, Solid-Tooth)

SIMONDS SAW AND STEEL CO
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO., making Quality Products for Industry

SIMONDS — Special Electric Furnace Steels
SIMONDS — Grinding Wheels and Grains
SIMONDS — Simonds Products for Canada

SIMONDS "Red End" HACKSAW BLADES

WHEN YOU USE SIMONDS YOU STAY IN THE HIGHLANDS . . . OF CONSISTENT CUTTING EFFICIENCY

REMOVE METAL *Fast*

with these Brown & Sharpe Side Mills

SIDE MILLING CUTTERS
Frequently used in pairs for cross-slots, half keeds and similar work. Have cutting edges on both sides of teeth as well as periphery.

STAGGERED TOOTH SIDE MILLING CUTTER
Alternate right- and left-hand spiral angles with considerable amount of undercut permit these cutters to remove large amounts of metal without destructive vibration and chatter. Used in pairs as interlocking cutters.

HALF SIDE MILLING CUTTERS
Used for side cuts, as in straddle milling or in cutting slots, where complete bottom finish isn't required. Spiral on top and undercut on side give them improved cutting action.

PUT any one of these Brown & Sharpe Side Milling Cutters to work on a piece of metal and that metal will take shape quickly and accurately. In actual operation, you'll benefit by the inherent qualities of Brown & Sharpe design and craftsmanship that set the pace for all types of cutters.

These side mills have clean-cutting qualities . . . ample chip space, carefully calculated rake angle, selected steels, scientific heat treatment individualized for each type of cutter, and expert sharpening. These are qualities that users have learned to expect in Brown & Sharpe Cutters. They're money-savers and production boosters because they combine to give unexcelled performance in speed, accuracy and more pieces per sharpening. Specify Brown & Sharpe when ordering cutters. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

Visit our Booth 602, A.S.T.E. Exposition, Cleveland

BROWN & SHARPE CUTTERS B·S

PERFORMANCE IS BUILT INTO
NATIONAL METAL CUTTING TOOLS

MANUFACTURING FACILITIES

National Counterbores are available with or without pilots, and with taper shank or straight shank holders. National End Mills are available in a wide variety of sizes and types, including both double and single end.

● "Why is it that National tools last so much longer?" One reason, we believe, is that in our new plant at Rochester, Michigan, we have the most complete and up-to-date manufacturing facilities to be found anywhere. These facilities contribute to the performance built into National High Speed and Carbon Steel Twist Drills and Reamers, High Speed Steel Milling Cutters, End Mills, Hobs, Counterbores, and Special Tools.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division — Winter Bros. Co.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

NATIONAL TWIST DRILL & TOOL ROCHESTER MICH. U.S.A.

MAKE YOUR PRODUCT GIVE GREATER SATISFACTION

THE manner in which a mechanical device performs is often determined by the excellence of the Small Gears you employ. Unless those Gears are . . 1. correctly designed, 2. made from the right materials, 3. uniformly cut to close tolerances, 4. and if required . . finished and polished to flawless smoothness . . excessive noise and vibration may shorten the life and ruin the performance of the product. Don't take chances. Only the finest Gears are good enough! You'll do well to entrust YOUR needs to G.S. . . *Specialists* in *production runs* of better Fractional Horsepower Gears exclusively for more than 30 years. Let our skilled Small Gear craftsmen aid you in producing a product that will give utmost satisfaction!

It's good business to "ASK G.S." when a small gear problem is involved. Or write today for the free G.S. Bulletin describing almost 100 G.S. Small Gears and applications.

GEAR Specialties

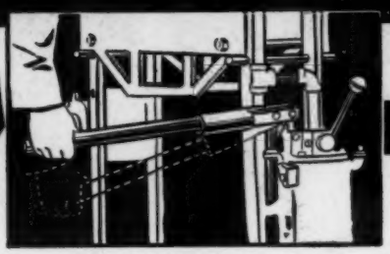
Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

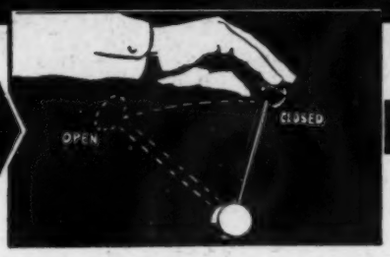
MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

These KRW Hydraulic Arbor Press Features ...

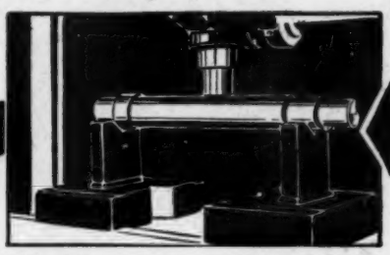


Fast Action, cylinder is filled as ram travels to work. You get tons of pressure with first pump stroke.

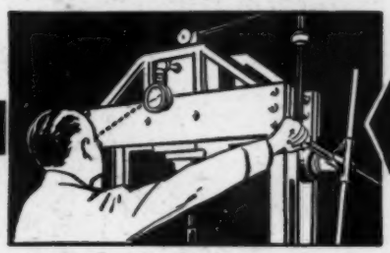


Finger Tip Control opens and closes valve in a jiffy. No gripping effort assures easier, faster operation.

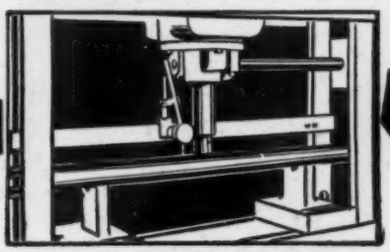
KRW Built-in Mechanical Press permits up to 3 tons pressure for straightening small diameter work.



One Piece, All Steel V-Blocks have machined surfaces for greater accuracy; usable upright or inverted.

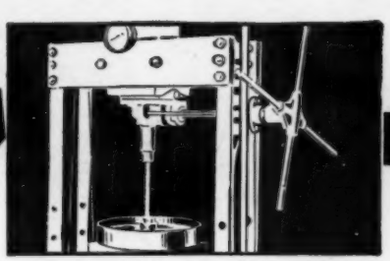


Highly Visible Pressure Gauges are mounted where they can be quickly checked. Read in tons and pounds.

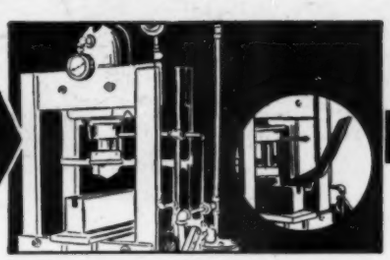


Micrometer Dial Attachment permits great accuracy in checking work without removing from V-block.

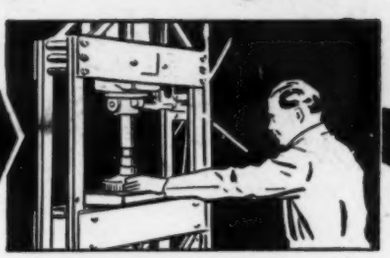
Reduce Costs ON THESE AND OTHER DAILY Production Jobs ...



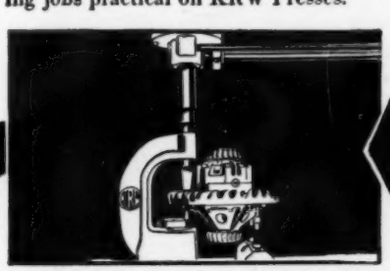
Broaching a key way in a flywheel. 7½ inch ram travel makes many broaching jobs practical on KRW Presses.



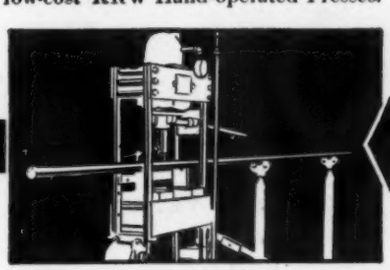
Bending in production lots with simple, inexpensive dies is easily done on low-cost KRW Hand-operated Presses.



Pressing of all types is efficiently handled. Adjustable bed makes pressing on long shafts a very simple operation.



Riveting with KRW Riveting Attachment is simplicity itself. Many KRW Presses are used for this type work.



Straightening, especially on long work, is easy on a KRW Press because of its special open-end construction.

Blanking is easy with simple die set for short-run operations. Releases regular equipment for quantity production.

Write for the **NEW KRW** *Catalog.....*

K·R·WILSON

15 MAIN STREET, BUFFALO 3, N. Y.

K. R. WILSON, 215-217 Main St., Buffalo 3, N. Y.

Please mail me a copy of your Hydraulic Arbor Press Catalog 11

Name .....

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POWER
RIGIDITY
CONVENIENCE

characterize the

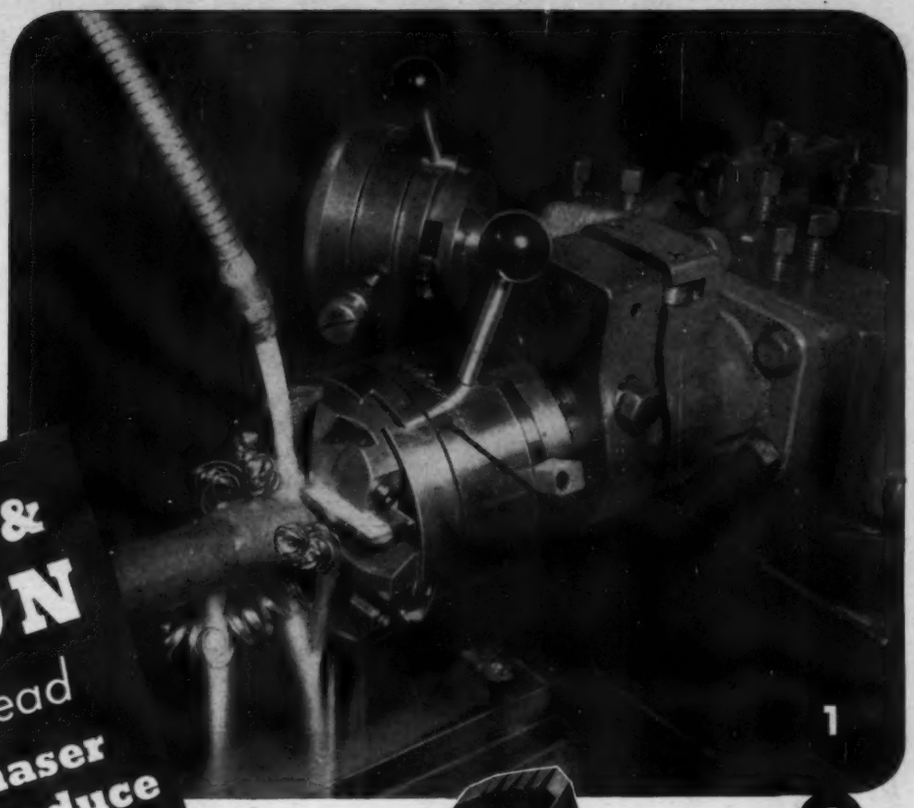
GRAY MILLING MACHINES

YOU NEED all three qualities for maximum production. Power without Rigidity will cause poor work and short tool life. Rigidity without adequate Power means that you cannot drive modern cutting tools at maximum speeds, feeds, and depth of cut, but Power and Rigidity without Convenience will result in waste man hours and consequent inefficient operation. Therefore, we say you must have Power, Rigidity and Convenience for Maximum Production, and the Gray Milling Machine has all three.

The G.A. **GRAY** *Company*

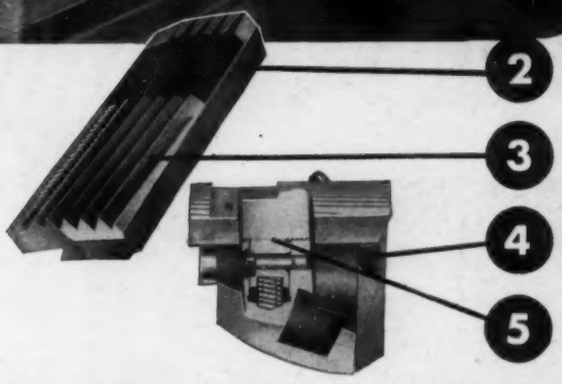
planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.



JONES & LAMSON

Ground Thread Tangent Chaser Die Heads Produce Better Threads at lower cost



—— because

1. They are hardened and ground throughout. The body is lapped on the face and in the dovetail slots. Chaser holder bearing surfaces are lapped into the body.

2. Chasers are guaranteed to produce threads of Class III fit.

3. Exact helix angle is ground into the chasers after hardening.

4. With a single set of chaser holders, any thread, within the rated capacity of the holders can be cut, regardless of helix angle, eliminating the expense and trouble of constantly changing holders for different helix angles.

5. Chasers are set quickly and easily.

If you are interested in greater economy and better quality in threading, write to us (*Department 710*) for complete information about our Die Heads.

Jones & Lamson

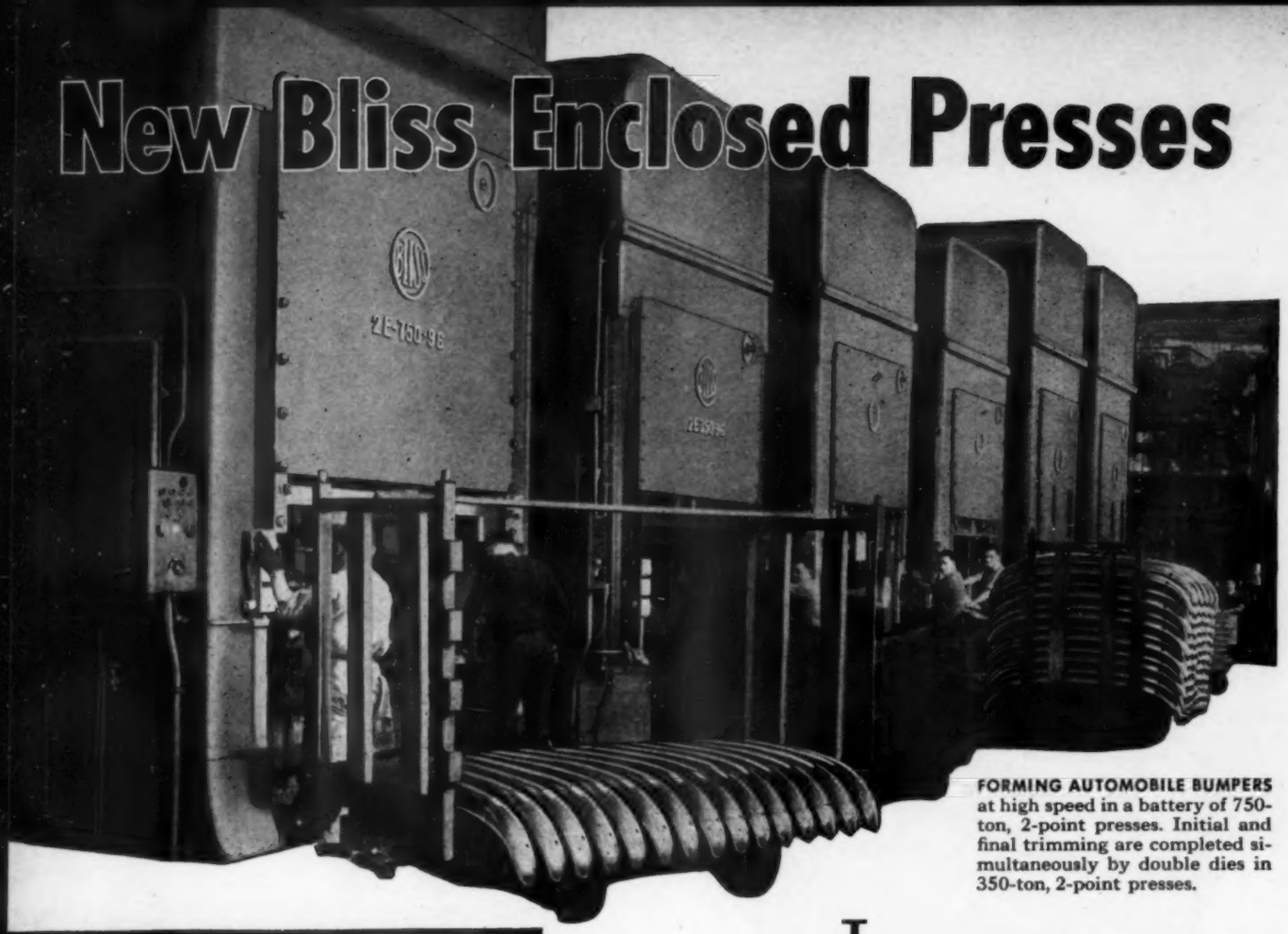
AVAILABLE IN STATIONARY & REVOLVING TYPES

TANGENT DIE HEADS

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

New Bliss Enclosed Presses



FORMING AUTOMOBILE BUMPERS at high speed in a battery of 750-ton, 2-point presses. Initial and final trimming are completed simultaneously by double dies in 350-ton, 2-point presses.

ENTIRE TOP OF CAR being trimmed in a Bliss 4-point single action press.

FULLY AUTOMATIC PRODUCTION of hub caps in Bliss 2-point press with transfer feed and progressive dies.

IT takes a *complete* line of modern equipment like these new Bliss Enclosed Presses to keep pace with all the changing requirements of new tooling...the intricate shapes and die designs...multiple operations...the increasing trend to automatic production cycles and more economical materials handling methods.

All of these important factors are engineered into the Bliss Enclosed Press line. For example:

Specially designed roll, push, transfer or stack feeds for automatic or semi-automatic operation.

Transfer mechanisms for simple changeover from single to progressive die work.

Latest type push-button operated air friction clutches for intermediate or continuous operation, inching, stop-and-start at any point of the stroke.

Open back designs for feeding front-to-back or left-to-right.

Pneumatic or hydro-pneumatic cushions for deep drawing of complicated shapes.

And there's the added combination of operator safety, improved appearance and cleanliness of operation.

Look over the details of some of the presses described at the right. Let a Bliss Sales Engineer help you to select the right press for your retooling needs ...one-, two-, or four-point; single-, double-, or triple-action...from Bliss' 124 sizes and capacities. If special-type presses are called for, Bliss can help you, too. For Bliss builds more types and sizes of presses—mechanical and hydraulic—than any other company.

Bliss builds more

...as modern as your new tooling

124 Standard Sizes and Capacities to meet every retooling and production need

SINGLE ACTION PRESSES:

1- 2- AND 4-POINT PRESSES: For piercing, blanking, forming, trimming and restriking operations or double action drawing with Bliss Marquette Die Cushions.

4-POINT ECCENTRIC PRESSES: For heavy gauge forming, stamping, swaging, piercing or blanking.

4-POINT UNDER DRIVEN PRESSES: For large one-piece stampings or multiple die operations. Drive located under bed, provides greater accessibility to working parts, requires less headroom. Permits repair and maintenance without interference with production.

GAP FRAME ENCLOSED PRESSES: Open back design permits feeding front-to-back or left-to-right, simplifies materials handling. Available in a wide variety of sizes.

DOUBLE ACTION TOGGLE PRESSES:

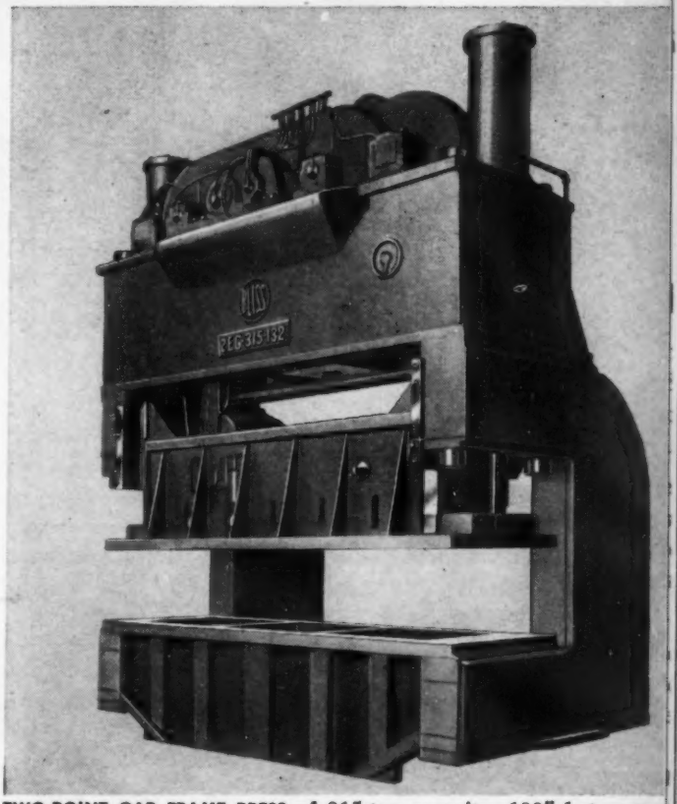
1- AND 2-POINT: For deep drawing or forming of large or small stampings. Can be equipped with cushions for complicated deep drawing or to provide the equivalent of a third action for shallow reverse draws.

TRIPLE ACTION TOGGLE PRESSES:

Can be supplied with an independently driven third action if necessary.

We're certain you'll want to know more about these presses and we're ready to supply complete information. Just tell us what types you're interested in.

REFRIGERATOR DOORS drawn in a 350-ton single action press with Bliss Marquette Cushion in the bed.



TWO-POINT GAP FRAME PRESS of 315-ton capacity—132" between uprights; all steel. Four shrunk tie rods connect crown to body. All gearing runs in oil. Speed is reduced to one-half normal at mid-stroke, accelerated to full speed at bottom stroke and return cycle.

E. W. BLISS COMPANY, 450 AMSTERDAM AVENUE, DETROIT 2, MICHIGAN

Mechanical and Hydraulic Presses, Rolling Mills, Can and Container Machinery

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Michigan; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES AT: Detroit, Hastings, Michigan; New York, Rochester, N. Y.; Cleveland, Dayton, Toledo, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Illinois; Boston, Mass.; New Haven, Conn.; Windsor, Ontario.

STAY AHEAD WITH *Bliss*

types and sizes of presses than any other company

STAYS CLOSED

At top indexing speeds

At last—here's a die head that's built for easy, positive resetting, yet *cannot open* under rapid indexing.

And the adjustable stop for opening provides accurate-length thread. No length adjustment is necessary after grinding the chasers. With this unique design you can thread up close to shoulders, too.

Chasers and blocks are interchangeable, size for size, with styles DR and DS Vers-O-Tool heads. That means you get all the advantages of the famous Vers-O-Tool design—fewer parts, hardened and ground throughout; long-life circular chasers, regrindable through a full 270°; micrometer gage checking for accuracy of grinds and quick diametric adjustment.

The Namco style DBS head is equally adaptable for use with both thread chasers and hollow mill cutters for end-forming and turning operations. Capacities range from .056″ to 1″.

May we quote on your requirements?

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

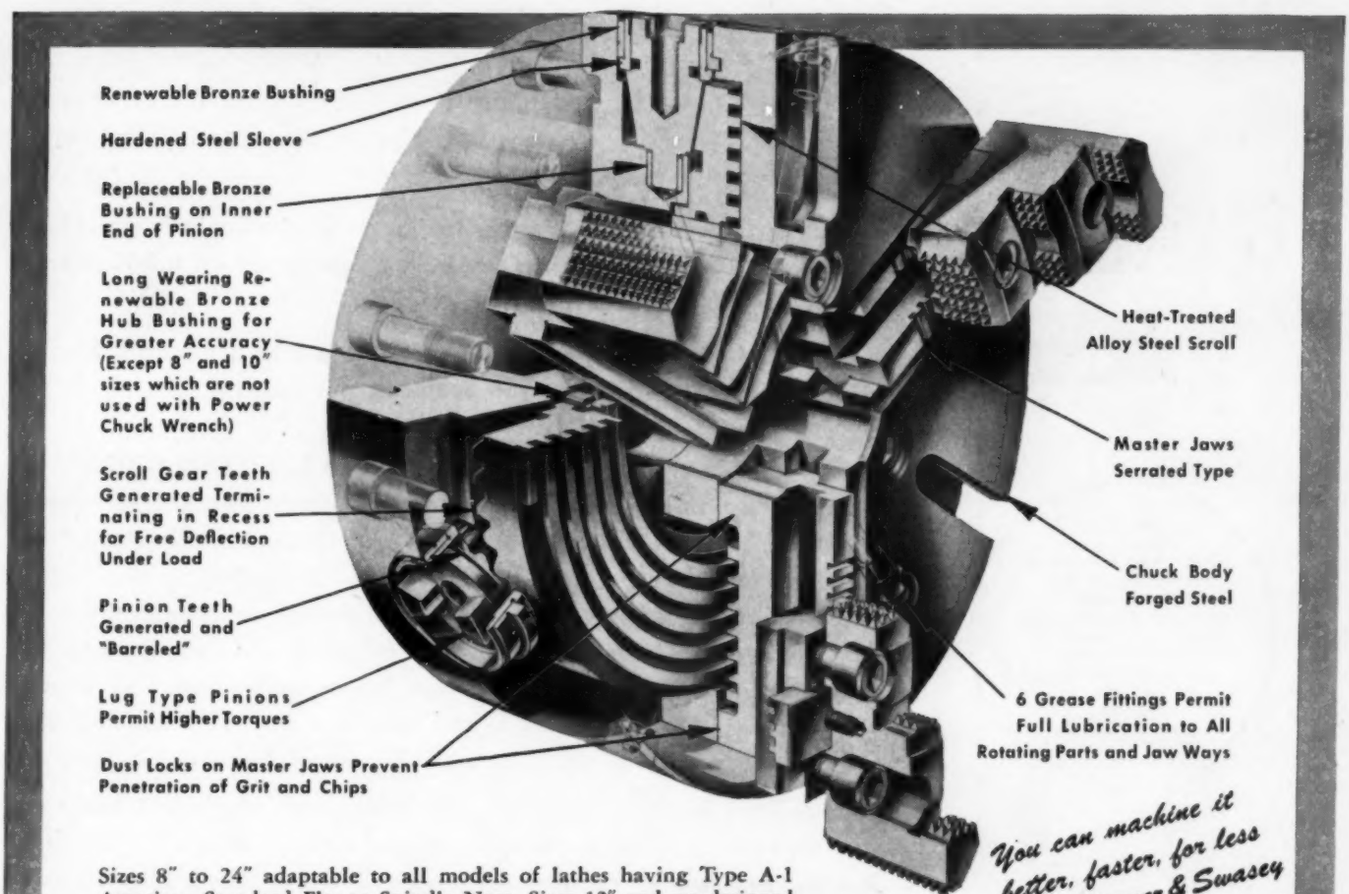
Here's why THE WARNER & SWASEY EXTRA HEAVY-DUTY GEARED SCROLL CHUCK

IS MORE RUGGED – EASIER OPERATING – LONGER LASTING

● Precision manufacture assures closer tolerances. High carbon steel forging used in body. "Barreling" of pinion teeth allows limited bearing with light load and deflection under heavy load to produce full bearing.

Lug type dust locks at both ends of master jaws keep out dirt and chips. Complete lubrication prevents wear. Serrated jaw makes long movement of jaws unnecessary and reduces wear on scroll and pinion.

Better fits from closer tolerances. Complete lubrication to *all* rotating parts and jaw ways. Pinions and scroll turn on renewable bronze bushings. Serrated jaws permit easier setups.


Renewable Bronze Bushing
Hardened Steel Sleeve
Replaceable Bronze Bushing on Inner End of Pinion
Long Wearing Renewable Bronze Hub Bushing for Greater Accuracy (Except 8" and 10" sizes which are not used with Power Chuck Wrench)
Scroll Gear Teeth Generated Terminating in Recess for Free Deflection Under Load
Pinion Teeth Generated and "Barreled"
Lug Type Pinions Permit Higher Torques
Dust Locks on Master Jaws Prevent Penetration of Grit and Chips
Heat-Treated Alloy Steel Scroll
Master Jaws Serrated Type
Chuck Body Forged Steel
6 Grease Fittings Permit Full Lubrication to All Rotating Parts and Jaw Ways

You can machine it better, faster, for less ...with a Warner & Swasey

Sizes 8" to 24" adaptable to all models of lathes having Type A-1 American Standard Flange Spindle Nose. Sizes 12" and up designed especially for use with Power Chuck Wrench. Choice of Serrated Type or Tongue and Groove Type American Standard Top Jaws.

For full information on this new chuck line and the many other new developments introduced by Warner & Swasey, see your Warner & Swasey field representative or write Warner & Swasey, Cleveland.

WARNER & SWASEY Machine Tools *Cleveland*

TURRET LATHES • SINGLE AND MULTIPLE SPINDLE AUTOMATICS
PRECISION TAPPING AND THREADING MACHINES

PUT IT ON THE BLANCHARD

The one best way of grinding three-way pieces

THE JOB

Produce a true flat surface on the central flange of the illustrated cast iron Three-Way Pieces—removing an average of 1/8" of stock from the rough casting.

THE METHOD

The parts are held in simple, inexpensive, mechanical, clamping fixture. 12 of these fixtures are held magnetically on a 36" chuck of a No. 18 Blanchard Surface Grinder.

BLANCHARD PRODUCTION

Actual grinding time for each load of 12 is 4 to 5 minutes. Floor-to-floor time is 60 pieces (60 surfaces) per hour.

This job illustrates the ease of adapting BLANCHARD GRINDING to the machining of flat surfaces of odd-shaped pieces. One operation quickly produces the required smooth, accurately sized, flat surface on the entire chuck load of parts. The grinding wheel of a Blanchard takes broad cuts over a large surface area continuously—removing metal at all times—*not* grinding air. This results in greater accuracy, finer finish, and better production. In short, BLANCHARD GRINDING is the one best way of producing flat surfaces on most of the products of modern industry.

Blanchard Engineers will be pleased to study the adaptability of Blanchard Grinding to your odd-shaped work. Just send us the data with, if possible, samples. Blanchard Consultation Service and Sample Grinding are free for the asking and involve no obligation.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

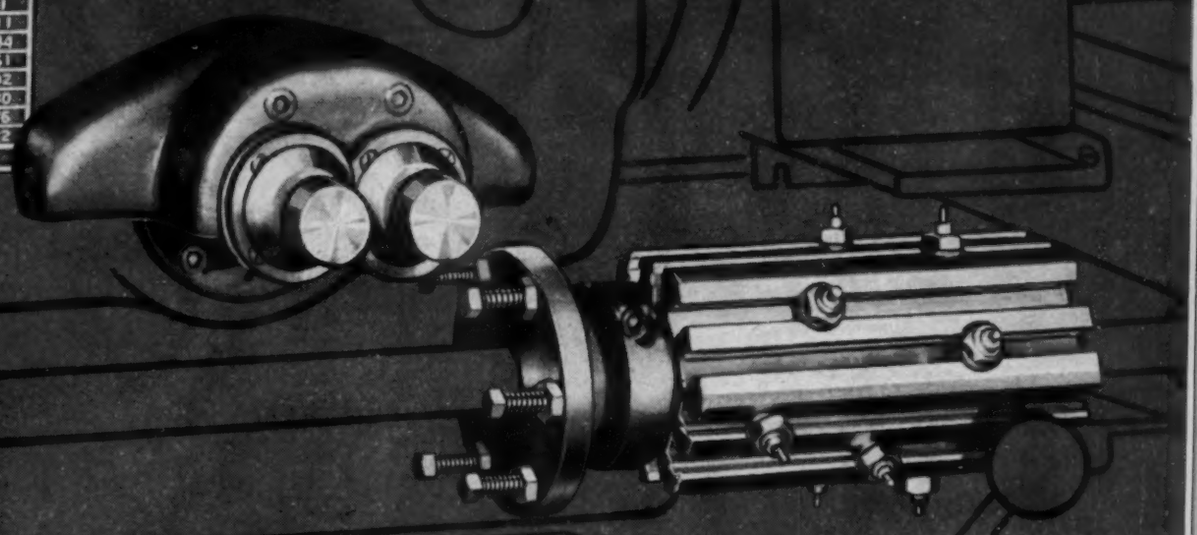
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

GISHOLT FASTERMATICS

(AUTOMATIC TURRET LATHES)

CHANGE GEARS NO. TEETH DRIVEN		SPINDLE SPEEDS VALVE DIAL POSITIONS		
	LOWER	NO. 183	NO. 184	NO. 283
25	65	22	40	74
29	61	27	50	91
33	57	33	61	111
37	53	40	73	134
41	49	48	87	161
45	45	57	105	192
49	41	68	125	230
53	37	81	150	276
57	33	98	181	332

DRIVE SHAFT SPEED 1040 R.P.M.

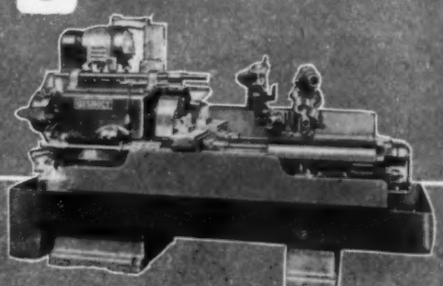


These simple controls provide automatic (or manual) selection of speeds--to save time --cut machining costs

GISHOLT MACHINE COMPANY, *Madison 3, Wisconsin*

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.



THE FASTERMATICS—Speed changes are effected as buttons in spool contact hydraulic control knobs. Changes may be made automatically at any point during hexagon turret's travel, or manually for convenience of set-up. Various ranges of spindle speeds are available.

turret lathes · automatic lathes · superfinishers · balancers · special machines

Sunnen Honing

Cuts Costs - Reduces Rejects

Eliminates Bell-mouth, Taper and Out-of-Round Holes

The Sunnen Precision Honing Machine produces a straight round hole in any size from .120" to 2.625" in diameter. Extremely smooth internal finishes can be held to a tolerance of .0001", if required.

This low-cost versatile machine duplicates sizes quickly and accurately — saves set-up time because there is no chucking of parts; and mandrels can be changed from one size to another in less than one minute.

Sunnen Honing corrects heat-treat distortion, rapidly removes cut-off and cross-drill burrs and flash from machined and punched parts. Permits final sizing after hardening.

A complete line of abrasives is available to produce any degree of surface finish required—in steel, cast iron, bronze, aluminum, carbides, ceramics, plastic or glass,

Sunnen Honing provides real savings in long run production costs. Even greater savings are possible on job lots and small runs when frequent size changes are necessary.

Write for bulletin, or on request we'll send a honing engineer to your plant.

SUNNEN
TRADE MARK REG U S PAT OFF - MARCA REGISTRADA

SUNNEN PRODUCTS COMPANY • 7941 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

300

Typical Examples:

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Smooth surfaces provide long life for washing machine parts.

Miniature aircraft cylinder — smooth, accurate honing provides better compression and longer life.

Bell-mouth eliminated, production increased on these line reamer bushings.

Smooth finish and close tolerance easily held on 1⅛" hole in steel vibrator body.

DANLY *Special Purpose*

Straight-Side Presses

PERMANENTLY inclined to 23 degrees, this eccentric gear press shows one example of the adaptations of Danly Straight-Side Presses which can be built to fit your needs. The frame is of four piece tie rod construction. Its clean modern design facilitates rapid loading and unloading and easy scrap removal.

Large square back gibs provide an ample bearing surface to keep the slide in perfect alignment. Air cylinders enclosed in the uprights adequately counterbalance the weight of the slide, gear train and dies.

Danly Circulating Filtered Oil System brings the *right amount* of clean, pump-driven, filtered oil to all gears, bearings and driving members in the crown and slide, *including the flywheel bearings*. Lubricating the flywheel bearings in this way makes it unnecessary to manually lubricate this member at the top of the press.

Safety is assured by the fully enclosed construction of this press, by the two-wire electric control system, and by Danly's cool running air friction clutch which provides instant starting and stopping of the driving machinery.

You can get further information on the type of press shown here or on any one of a complete line of Straight-Side Presses by writing or calling Danly's Press Division.

DANLY

MACHINE SPECIALTIES, INC.

2100 S. 52nd Avenue, Chicago 50, Illinois

The Press for Modern Production

ARMSTRONG

More ARMSTRONG TOOL HOLDERS for *More* Profit

Whenever you tool a new operation with the correct ARMSTRONG TOOL HOLDER, you increase your profit. Each has the extra efficiency resulting from over 50 years of continuous development and refinement in designs; the extra strength resulting from modern metallurgy and manufacturing methods.

With ARMSTRONG TOOL HOLDERS you can take advantage of the new high speeds and heavier feeds of the newer cutting materials, without revolutionary changes or costly experimentation. They are the most profitable tools obtainable; the lowest in initial cost, the longest in service and most economical in use, for all incorporate the basic Armstrong Principle of small interchangeable cutter-bits in permanent drop forged shanks. They are the most readily obtainable tools too, for they are stocked by all leading distributors.

With emergencies, restrictions and controls passing, now is the time to tool up for normal business with more ARMSTRONG TOOL HOLDERS, for more profit.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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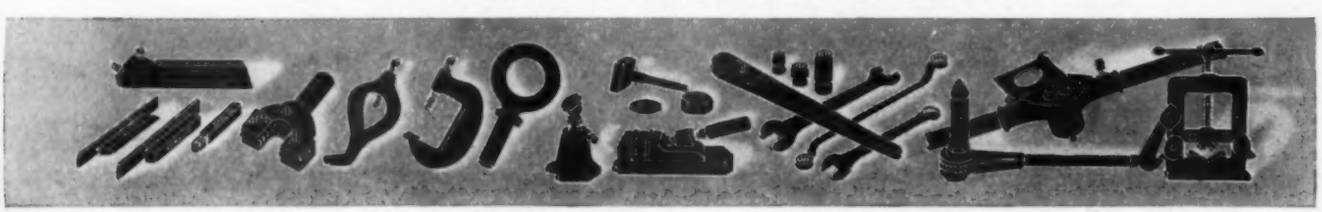
Eastern Whse. & Sales Office: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3, California



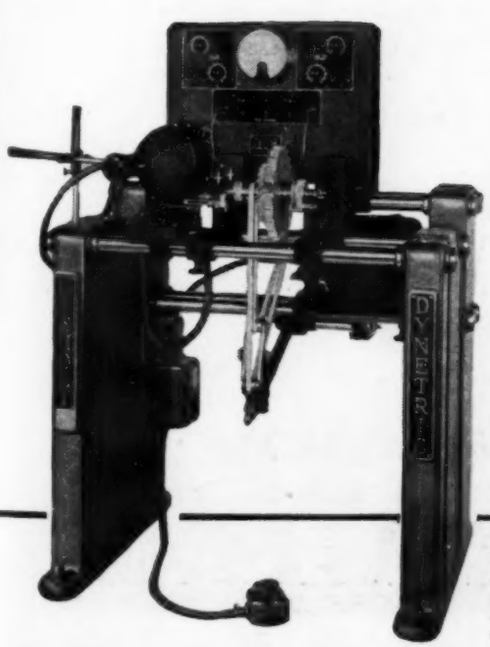
BALANCING 125 ARMATURES PER HOUR

on a Gisholt DYNETRIC Balancing Machine†*

Here's a production set-up for balancing small motor armatures for vacuum sweepers. One operator locates and measures unbalance with a Gisholt Type S Balancer and passes parts to another operator who applies the indicated correction. Parts are then returned to the Gisholt Balancer for inspection.

So efficient is this set-up that 1000 armatures are tested for unbalance, corrected and inspected in an eight-hour day—a rate of better than two a minute. Production was so increased over previous methods that the machine paid for itself in a few months.

The remarkable speed and accuracy of Gisholt DYNETRIC Balancers make it possible for you to cut costs to rock bottom. There are sizes and types to handle all rotating parts from a fraction of an ounce to many tons. Write for literature.



GISHOLT MACHINE COMPANY
Madison 3, Wisconsin

**Trade-mark Reg. U. S. Pat. Office by Westinghouse Electric Corporation*

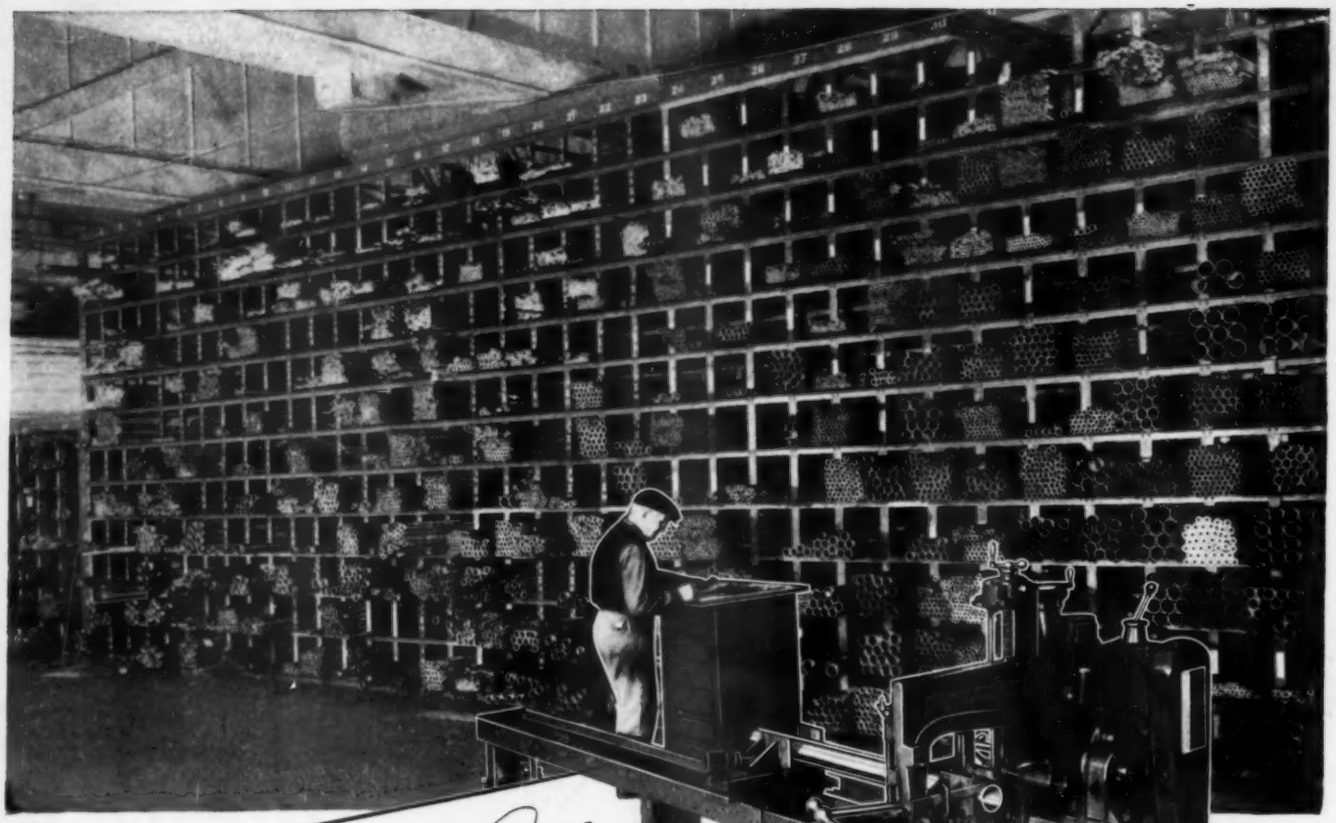
†Developed jointly with Westinghouse Electric Corporation

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and part round parts. Your problems are welcomed here.

***Gisholt DYNETRIC Type S Balancers** are designed for balancing parts within a weight range of a fraction of an ounce up to 200 pounds. Complete information on request.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



PETER A. FRASSE AND CO., INC.

Founded

Armstrong-Blum Mfg. Co.
5700 Bloomingdale Avenue
Chicago 39, Illinois

Gentlemen:

We are very satisfied with the performance of the new 6A and 9A Marvel Heavy-Duty Automatic Hack Saw Machines recently installed in our Warehouses. Our decision to purchase these new Marvel saws was based on the satisfactory performance we have been receiving for the past 10 years from our original Marvel machines.

In our business of warehouse distribution of carbon, alloy and stainless steel bars and tubes, we are called upon to make accurate cut lengths for customers, and on numerous occasions handle orders for hundreds and sometimes thousands of multiple cut pieces. Our Marvel saws help us to rapidly and efficiently handle such sawing requirements.

Marvel saws and high-speed edge hack saw blades are giving satisfactory performance in all our warehouses, and your service has been most cooperative.

Very truly yours,

PETER A. FRASSE AND CO., INC.

W. E. Davis
Assistant Vice President

WED/amc

MARVEL Saws Speed-up Deliveries

You will get cut-off lengths in any quantity faster from the steel warehouses and stockrooms that are equipped with MARVEL 6A and 9A Automatic Hack Saws. Far faster, floor to floor, than any other hack saws, they save valuable machine hours by reducing cutting-off time to a fraction,—save other machining hours by producing accurately cut pieces of exact length.

ARMSTRONG-BLUM MFG. COMPANY

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE CHICAGO 39, U. S. A.

MARVEL *Metal Cutting* SAWS

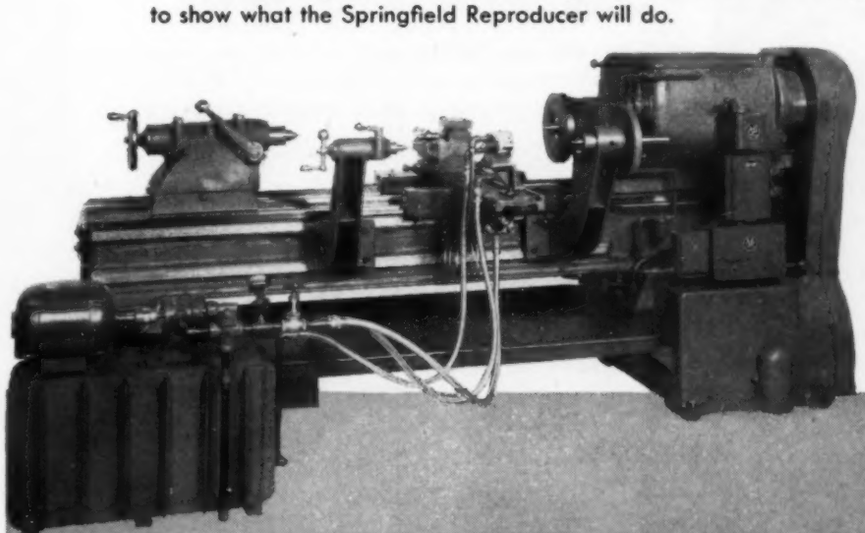
Better Machines—Better Blades

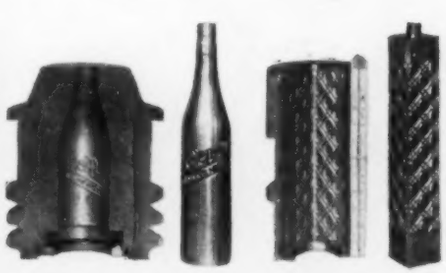
WITH SPRINGFIELD HYDRAULIC REPRODUCER

Now you can secure ***accurate*** three dimensional contour reproductions with the completely hydraulic, super-sensitive Springfield Reproducer on Springfield Geared Head Lathes. Reproduces internal, external, and face contours using a master, a template or the piece itself. Holds reproduction to extreme limits of accuracy.

Its usefulness and versatility are remarkable—it will trace a compound curve, follow the flats of a square milk bottle, profile and write simultaneously, bring out every detail of the most intricate design, turn a straight, smooth taper on a bar, cut a perfect spiral or a large cam and perform many similar money-saving, time-saving jobs that come up constantly.

Write today for catalog and complete information. We will gladly demonstrate on your work to show what the Springfield Reproducer will do.





Just two examples from many of the accurate reproductions from Springfield Reproducers. Letters and figures reproduced from the master; intricate designs reproduced on flat surfaces.

THE SPRINGFIELD MACHINE TOOL COMPANY

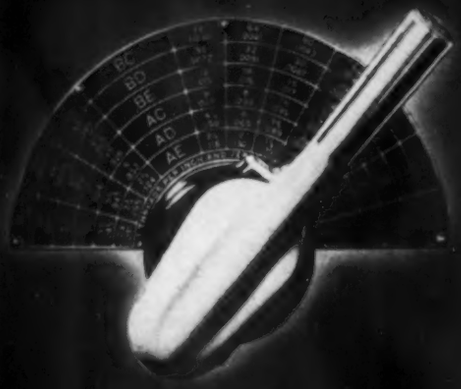
SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

SIDNEY CONTROLS

are convenient *and easy to operate*



● In developing the new Sidney Lathe particular attention has been given to the controls both as to convenience of location and as to manipulation.

The new controls are exceptionally easy to shift and the use of the single dial for Sidney's 32 spindle speeds can be quickly pre-selected by the operator. Also the complete range of feeds and leads are readily accessible by means of dial on the front of the gear box.

Apron controls have also been simplified and control for both longitudinal and cross feed is through independent clutch levers which actuate positive serrated jaw plates and is provided with an over-load safety feature.

Thus the new Sidney provides greater ease of operation—saves operator's time—and enables you to get greater production at lower costs.

Write for complete details.

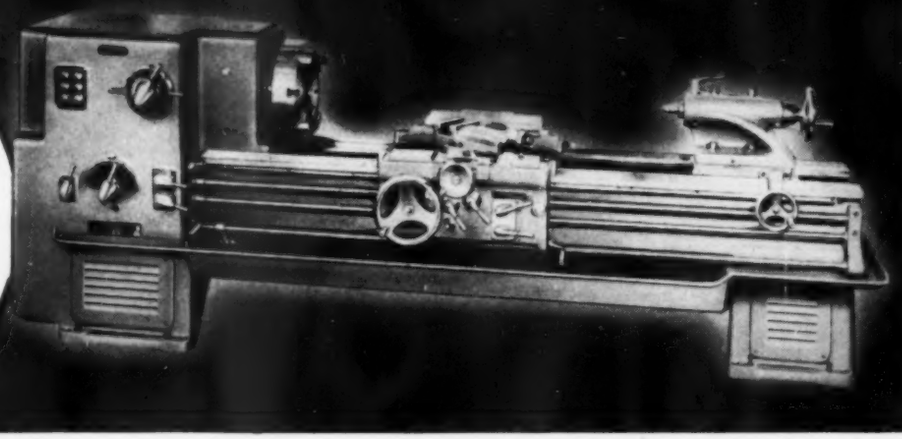
Builders of Precision Machinery

THE SIDNEY MACHINE TOOL COMPANY

SIDNEY • OHIO

SIDNEY

ESTABLISHED 1904



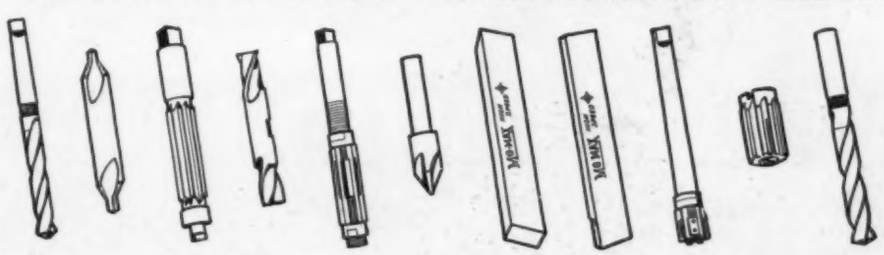
38% Longer Running Time Between Grinds

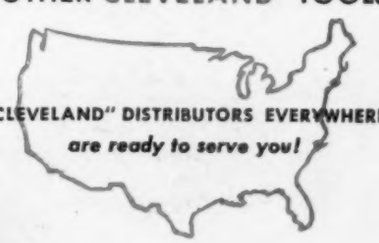
Actual test in customer's plant proves that CLE-FORGE HIGH SPEED DRILLS produce *more holes per grind*

A series of impartial tests on four makes of drills proved that CLE-FORGE High Speed Drills averaged 9 hours between grinds; the next best record was 6½ hours. ◈ You too can get greater production, less "down time" and lower costs by using CLE-FORGE High Speed Drills. Engineered into every one of them is the *stamina* that produces more holes per grind. ◈ Whenever you have a drilling problem, get in touch with a CLEVELAND Service Representative through our nearest Stockroom —or **Telephone Your Industrial Supply Distributor.**

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street **Cleveland 14, Ohio**
Stockrooms: **New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5**
Los Angeles 11 • London W. 3, England

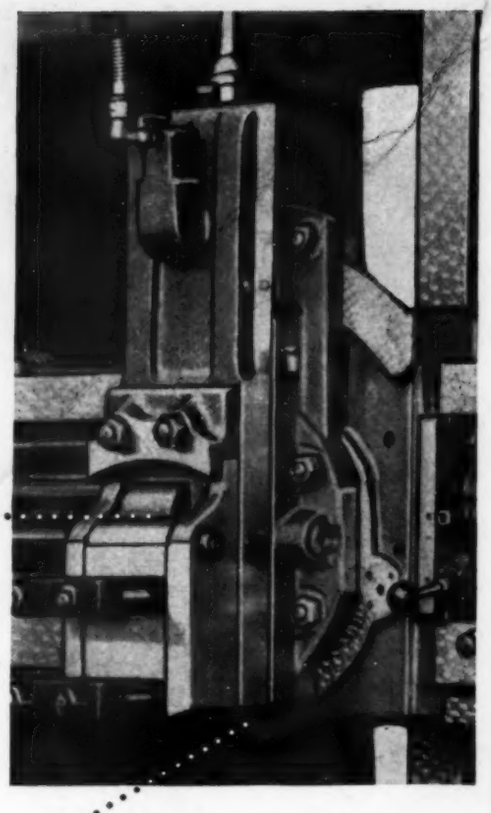
ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER CLEVELAND TOOLS





Both *in the Hypro rail head*

. . . these exclusive Hypro dependable features

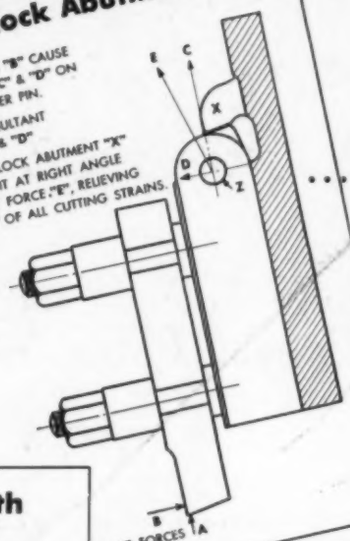


Exclusive Cincinnati Hypro Tool Block Abutment

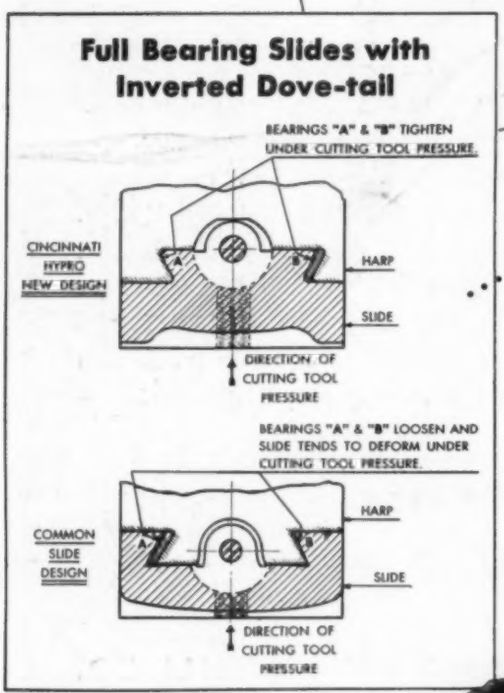
(1.) CUT FORCES "A" & "B" CAUSE ACTING FORCES "C" & "D" ON CLAPPER BOX TAPER PIN.

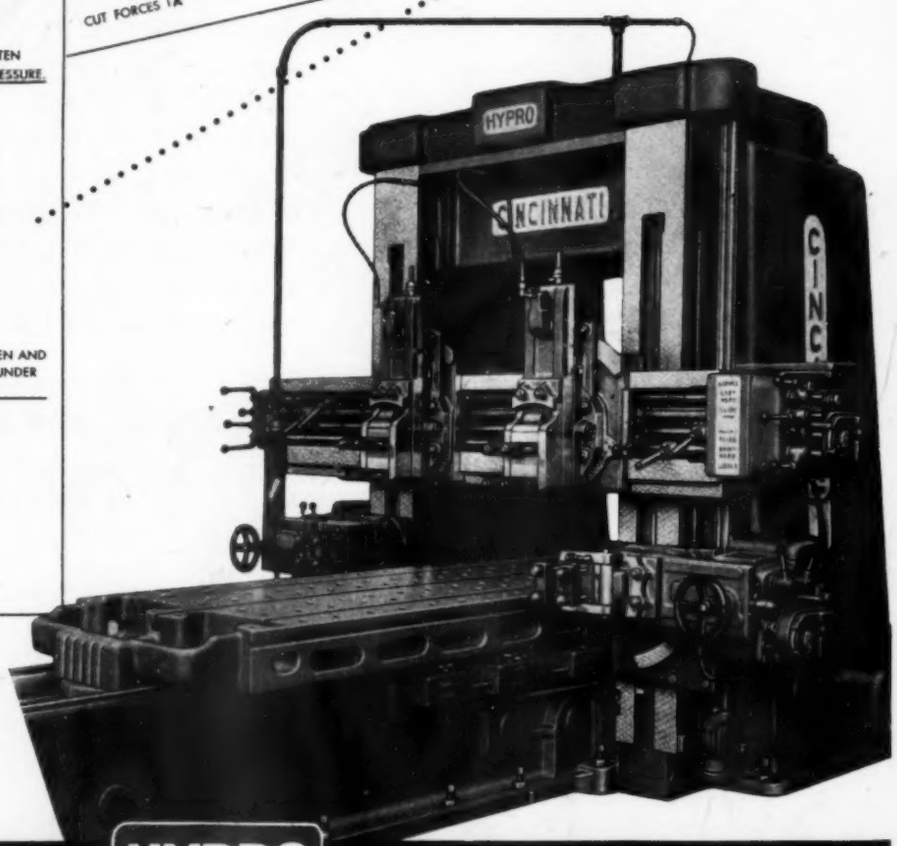
(2.) FORCE "E" IS RESULTANT OF FORCES "C" & "D"

(3.) HYPRO TOOL BLOCK ABUTMENT "X" IS PRECISION FIT AT RIGHT ANGLE TO RESULTANT FORCE "E", RELIEVING TAPER PIN "Z" OF ALL CUTTING STRAINS.



Full Bearing Slides with Inverted Dove-tail


BEARINGS "A" & "B" TIGHTEN UNDER CUTTING TOOL PRESSURE.
CINCINNATI HYPRO NEW DESIGN
HARP
SLIDE
DIRECTION OF CUTTING TOOL PRESSURE
BEARINGS "A" & "B" LOOSEN AND SLIDE TENDS TO DEFORM UNDER CUTTING TOOL PRESSURE.
COMMON SLIDE DESIGN
HARP
SLIDE
DIRECTION OF CUTTING TOOL PRESSURE

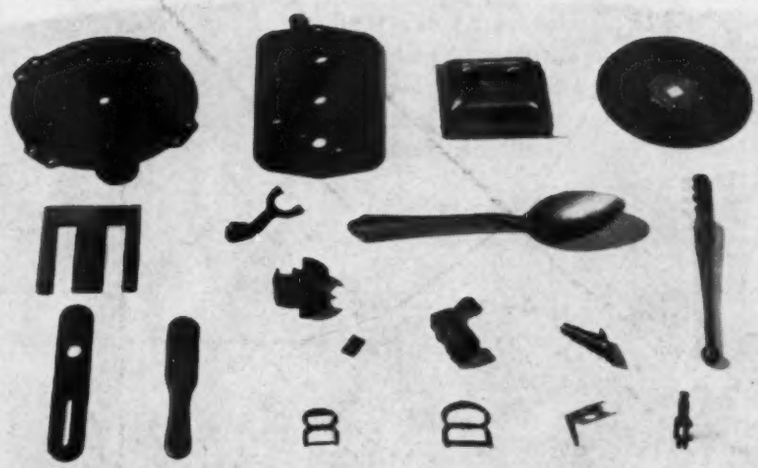


THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

Want to cut Tumbling Costs on parts like these?



Use ALUNDUM Abrasive as your tumbling medium

- It's all abrasive for a continuous cutting action.
- It's heavy for a fast, positive cut.
- It's hard and tough for a long, productive life.
- Write for the new, fact-packed booklet, "Precision TUMBLING with Alundum Abrasive" — sent free upon request.

NORTON COMPANY • WORCESTER 6, MASS.

Distributors in All Principal Cities

NORTON ABRASIVES

G-189

ACCURACY the EASY WAY...

with the Van Keuren GEAR MEASURING SYSTEM

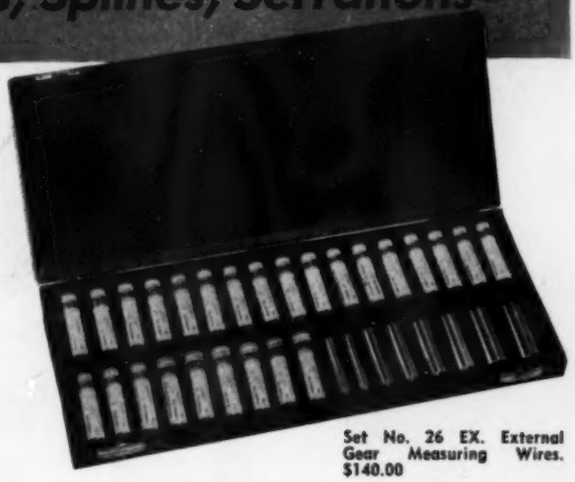
Spurs, Helicals, Splines, Serrations-

The Van Keuren Gear Measuring System is generally accepted as the easiest and most accurate method of checking tooth thickness of gears, 30° involute splines and 90° involute serrations. A measurement is made over two opposing wires and this actual measurement is compared with the theoretical measurement over wires for a perfect gear as computed from the Van Keuren tables for 1 diametral pitch gears.

The only equipment required is a set of 2 wires of the proper size for each diametral pitch.

Standard sizes of wires available from stock are:—

- 1.728"/DP — for external spurs and helicals
- 1.44"/DP — for internal spurs and splines
- 1.92"/DP — for enlarged pinions, 30° involute splines and 90° involute serrations.
- 1.68"/DP — Alternate series for special requirements.



Set No. 26 EX. External Gear Measuring Wires. $140.00

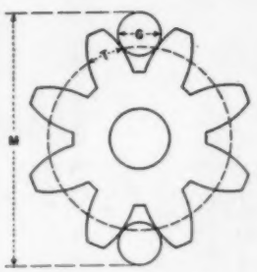
SIMPLE . . . For spur gears, involute splines and serrations, the only calculation is one of simple division. For helical gears use the simplified computation forms VK-103, VK-104 or VK-105.

RELIABLE . . . The 1.728"/DP System is used by over 90% of American gear producers and users. The 1.44"/DP and 1.92" DP systems have been incorporated in standards for involute splines and serrations.

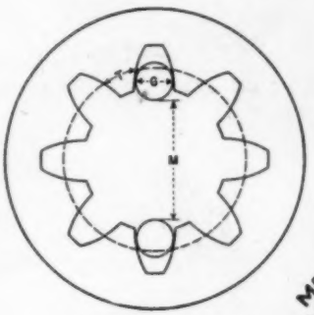
ACCURATE The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and the cutter must be fed further into the gear blank. Constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.

The New 1948 Catalog and Handbook No. 34 is a 208 page volume, which has been in preparation for nearly two years. It contains new and epoch making formulas and tables for the exact measurement of screws and worms and complete tables and formulas for using the Van Keuren gear measuring system.

Write for your copy



EXTERNAL SPUR GEAR



INTERNAL SPUR GEAR

MEMBER OF AGMA

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

29th YEAR

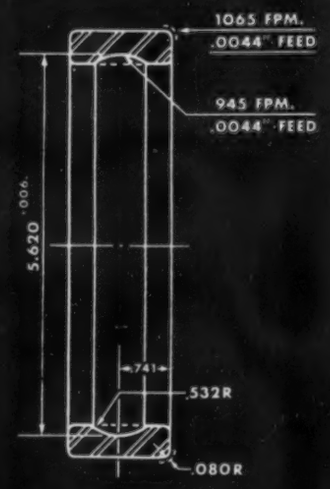
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

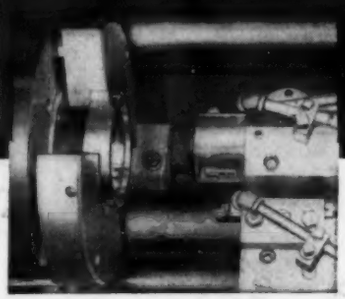
YOU CAN CUT YOUR TURNING COSTS

if

your lathes have the Power, Rigidity and Spindle Speeds to use Carbide Tools effectively.

Note the Power and Speed required to form the groove and chamfer the O. D. of this Outer Bearing Race, made of 52100 steel. IN 3½ SECONDS CUTTING TIME. *The 16" Fay Automatic Lathe transmits in excess of* 51 HORSEPOWER. *The forming cut is made at* 945 FPM WITH .0044 FEED; *the chamfering cut at* 1065 FPM WITH .0044 FEED.





Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

YOU CANNOT COMPETE with production like this with machines less powerful, less rigid.
Jones & Lamson Lathes guarantee your investment.
***They anticipate* the future in metal turning.**
***They are built* with great reserves of ruggedness.**
***They are powered* to meet even more than today's requirements for the effective use of carbide tools.**
Let a Jones & Lamson engineer study your turning operations. He will be able to make recommendations that will improve your profit picture. He has for others.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Jones & Lamson Lathes

ARE POWERED FOR CARBIDE

FOSDICK JIG BORER

For ACCURACY—FLEXIBILITY
and EASE of OPERATION

• The Fosdick Jig Borer is essentially a Tool-Room and Tool and Die Shop machine designed for accurate work at minimum cost.

One of the outstanding and exclusive features of the Fosdick Jig Borer is the location of all controls and operating handles at the front of the machine — a point of design which greatly reduces operators handling time and provides ease of operation.

In plants where production is small and precision is required this jig borer can be used to good advantage saving the cost of high-priced precision machines or expensive jigs and fixtures. In such plants it makes an ideal production machine and the hourly rate for parts produced is materially lower than if expensive machine tools were used.

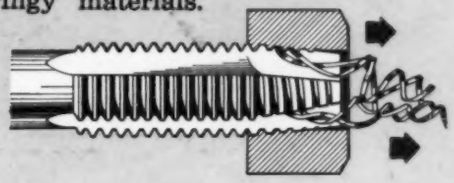
For full details of construction and additional information on tools, special equipment, and specifications, write for Fosdick Jig Borer bulletin JBA.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

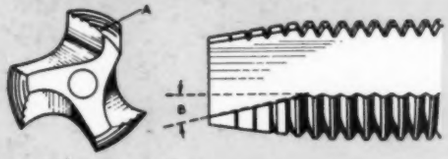
Facts about "GUN" TAPS

In the old days, most taps broke before they wore out.

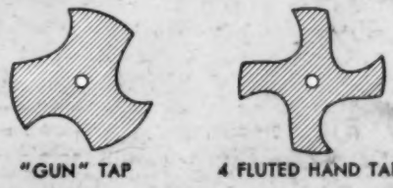
Then, for machine use, GTD "Greenfield" brought out the "Gun" Tap—a radical change in tap design. The "Gun" Tap "shot" the chips out ahead of the tap so that they didn't clog up in the flutes. This was especially important in tapping "stringy" materials.



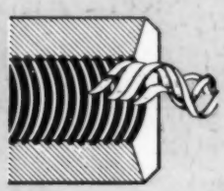
Note the design features of the "Gun" Tap in the illustration below. Cutting edges (A) at the point of the tap are ground at an angle (B) to the axis for four or five threads. This angle, plus a hook on the cutting edge of the land and the special flute form—makes long curling chips that shoot out ahead of the tap.



RESULT: a "Gun" Tap does not require deep flutes for elimination of chips. Therefore, fewer and shallower flutes are possible, insuring a large cross sectional area. This gives **EXTRA STRENGTH.**

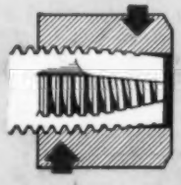


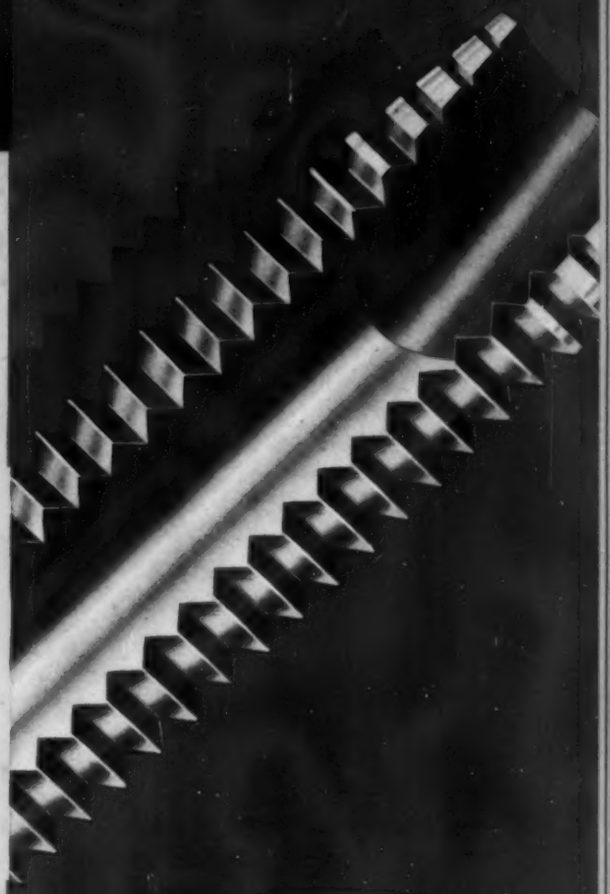
"GUN" TAP 4 FLUTED HAND TAP



And much **LESS POWER** is needed to drive the tap because it shears the metal instead of tearing or pulling it off with a scraping action.

Also a "Gun" Tap gives greater **ACCURACY** because the first few teeth do the cutting so that the rest of the threads can serve to steady the tap in the hole.





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THREADING TOOLS

When you buy GTD "Greenfield", you get a quality of product that comes from the world's largest, most modern threading tool plant and its research staff of threading engineers—PLUS SERVICE from the leading distributors and GTD "Greenfield's" field men in every industrial center.

GREENFIELD TAP and DIE CORPORATION GREENFIELD MASSACHUSETTS

Precision THREADING TOOLS

GEOMETRIC

STYLE DS Convertible Self-Opening DIE HEAD

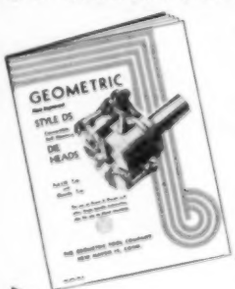
Here is precision plus!

Geometric's famous new improved Style DS Convertible Self-Opening Die Head offers precision threading in not just one, but in 4 different ways.

This versatile tool can be used as a (1) Pull-off Trip for automatics, (2) Outside Trip for automatics, (3) Pull-off Trip for hand machines or (4) Outside Trip for hand machines. The changes can be made quickly and easily without removing the head from the machine and without the necessity of getting new parts or removing or mutilating existing parts.

Made of special alloy steel, hardened and ground throughout, the DS head is a light but durable tool, designed to give precision performance over a long period of time. Unusually sensitive, the DS is especially recommended for cutting fine pitch threads of short lengths. It operates with perfect ease and accuracy at speeds up to 5,000 R.P.M. The new DS is built in six sizes with a cutting range from 1/16" to 1 3/4", and its chasers are interchangeable, size for size, with the old-style heads. ***Write today for the complete free story on this precision plus die head! No obligation of course!***

USE COUPON FOR FREE INFORMATIVE BULLETIN NO. DS-3



THE GEOMETRIC TOOL COMPANY
7 Valley Street
New Haven 15, Connecticut

Please rush me a copy of Bulletin No. DS-3 which describes in detail the new improved Geometric Style DS Convertible Self-Opening Die Head.

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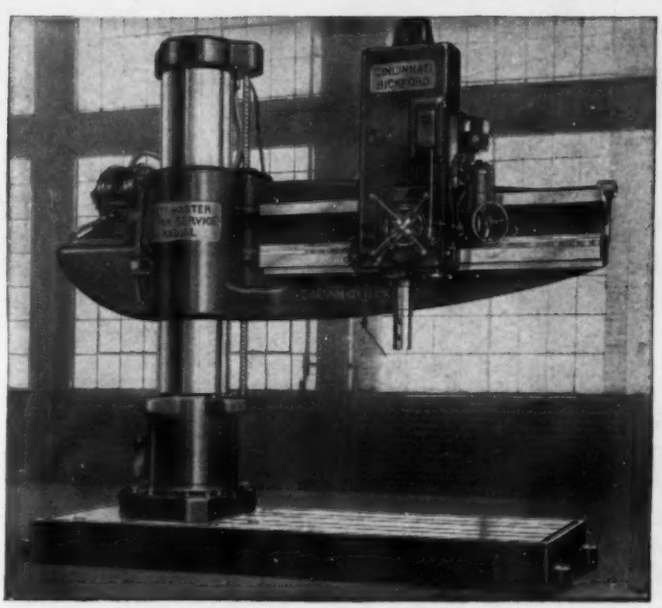
☐ *Bus.* ☐ *Res.*

*City*_____ *Zone*____ *State*_____

THE
GEOMETRIC
TOOL COMPANY — NEW HAVEN 15, CONN.

No Pin Hole Here!

Morgan Wire Block
No. 250
Morgan Construction Co.
Worcester, Massachusetts



If your work is big, the Cincinnati Bickford Master Super Service Radial offers the power and rigidity that are definitely required. It is easily operated, and the centralized controls answer to a touch.

Highly accurate, with capacities far in excess of what today's cutting tools will stand, it handles unusually large castings economically and efficiently.

The 26" column, 12' arm, with forty horsepower, constant speed motor, is one of the largest Radial Drills built.

If your work is big—write for Bulletin R-22.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

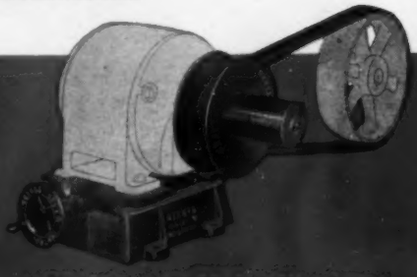
Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

Reeves-Equipped Machines—Industry's Recognized "Cost Cutters"

VARIABLE SPEED TRANSMISSION (above) for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

MOTODRIVE (below) combines motor, speed varying mechanism and reduction gears in single compact unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 15 hp.



VARI-SPEED MOTOR PULLEY (above) converts any standard constant speed motor to a variable speed drive within 4:1 ratio. Sizes to 15 hp.

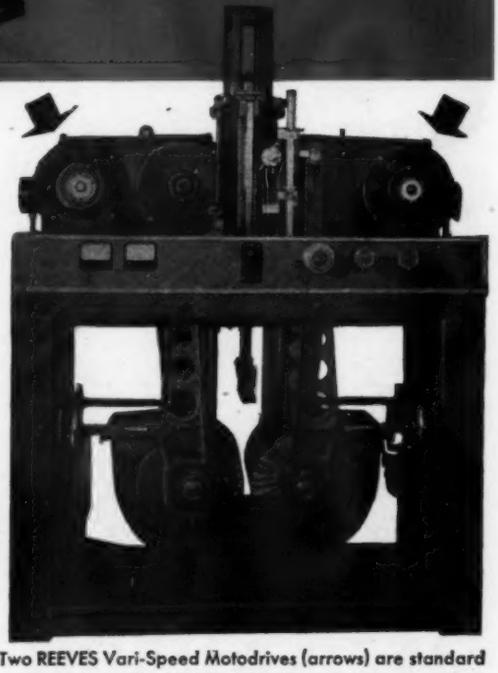
Material, labor and other production costs may be up—but there is a brighter side: the day-after-day performance of machines equipped with REEVES Variable Speed Drives . . . Industry's recognized and proved "cost cutters." Providing infinite, stepless speed adjustability, REEVES Speed Control makes a machine more versatile . . . more productive . . . more profitable. Without "shut downs," it provides the right speed for every operator and every operation under every changing condition . . . assures uniform quality in greater quantity and at lower cost. Simply designed, ruggedly constructed, easy-to-maintain REEVES units are standard equipment on more than 2,100 different makes of machines . . . are easily installed on those already in service. So, to make sure that your machines, new and old, qualify as real "cost cutters" . . . make sure they are REEVES-equipped. For complete information, send for the 114-page catalog A-450A.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Accurate Variable

REEVES Speed Control

Gives the Right Speed for Every Job!



Two REEVES Vari-Speed Motodrives (arrows) are standard equipment on this Nicholas Finishing Machine manufactured by Nicholas Equipment Company, Bellevue, O., and used for polishing and buffing cutlery. Use of the Motodrives makes it possible to synchronize the surface speed of both rolls and to select the exact speed required for each operation.

SPOT NEWS OF METALWORKING

The American Machinist Index of Metalworking Production advanced in January one point to 227 despite the break in the commodity market. All components of the Index rose slightly with the exception of the miscellaneous group, which held firm, Electrical Machinery dropped three.

SAE committee is working on standardizing drafting room practices and methods. Participating companies are highly in favor of the project. Standardization will simplify problems of machinery builders and other automotive suppliers. Programs will not be completed for a year.

A law to require equal pay for women who perform the same jobs as men is being pushed in Congress by Labor Secretary Schwellenbach and organized labor. Hearings have begun in the House.

All stock will be heated by induction prior to forging at the new forge plant of Ford Motor Co. at Canton, Ohio. Induction heating equipment is being acquired from WAA surpluses.

Adhesivenness of metal plating and paints can be measured up to more than 2.4 million times the pull of gravity, according to new Navy development. An ultra-centrifuge spins a small steel ball at speed of 1800 mph. in a vacuum. Section of metal plating or dot of paint is on ball. An oscilloscope, which checks on the speed, indicates when paint or plating is torn off. Reason for project: to get good thin coat of paint on skin of high-speed aircraft.

Pig iron produced in Texas is said to be bringing as much as $75 a ton. In certain cases it is being shipped up north though the freight rate is $13-$17 a ton. That's how badly it is needed.

> U.S. Bureau of Mines is producing 100 lb. of titanium and 65 lb. of zirconium a day, making these metals available to all kinds of research agencies under cooperative agreements whereby any developments on alloying or use are exchanged. Production cost of titanium is $4 a lb. and of zirconium slightly more. Experts believe both metals will compete extensively with stainless steel, stellite and tantalum in corrosion-resistant vessels, turbine blades, aircraft and surgery.

NLRB has ruled that an international union whose officers have complied with non-communist affidavits provision of Taft-Hartley law may participate in a union plant election even if its local union has failed to comply. Decision involved Warshawsky & Co., Chicago.

A $15-billion year in building construction is being predicted. Though this is the largest dollar volume in history inflated prices keep it from being the largest year of actual building. It represents a decrease from 1941 and is not near 1929 operations.

Bad weather has snarled shipments from metalworking plants. Example: a textile machinery maker has looms stored everywhere, in local warehouses, in factory aisles and in factory cafeteria, because it has been getting two or less freight cars per day instead of the normal five.

First of five pilot models of Warner & Swasey weaving machines is being given test runs. Assembly of other four is well along and tooling is proceeding for full production late this year. The machines are built under agreement with Sulzers of Switzerland.

Increasing number of craft union elections may soon plague industry. CIO successfully fought off attempt by AFL electrical workers to carve out a small bargaining unit of electricians and steam department employees from plant-wide CIO group at Scovill Mfg. Co., Waterbury, Conn.

German Index automatic screw machines will be built in England at Redditch by new subsidiary of B.S.A. Tools, Ltd., which bought the German plant under reparations agreement and already has removed 700 machines to England. Three metric sizes, specially suitable for Continental market and general export, will be made at first, deliveries starting late this year.

Gaging Metalworking

Metalworking Not Hurt

Up to now metalworking operations have not been hurt by the break in commodity markets. 1948 still looks like the biggest peacetime year. So far the break has been confined largely to farm products. It appears unlikely to spread to metalworking.

Many metalworking leaders look upon the situation as a healthy development. It has meant chiefly a redistribution of income. Farmers will get less and city dwellers will have more to spend. Parity prices being what they are, farmers won't get hurt. The break is another in a series of adjustments of the economy, like the soft-goods recession of a year ago, which will help to bring things into better balance.

Will Watch Inventories

The break, nevertheless, marks a change in business psychology which affects metalworking. From here on out, manufacturers will match inventories more closely. They probably will be more cautious about expansion at today's high costs. Cost-cutting measures will be pushed.

Prices promise to be more stabilized than heretofore. Companies which have been unwilling to quote firm prices on deliveries more than 90 days ahead, will be more willing to drop escalator clauses. Managements will be more hesistant about raising prices.

Pig Iron Causes Trouble

Pig iron is a headache, principally because the breakdown of many furnaces at one time suddenly curtailed available tonnage. Increased prices since Jan. 1 have not produced any more "pig." Meanwhile foundry inventories of pig iron are getting dangerously low, and some may be forced to reduce operations.

Large consumers have been combing the country for pig iron and have paid as much as $17 a ton freight to haul it from far-distant spots to their foundries. Even barter of other goods for pig iron is reported.

Underlying Demand Heavy

The underlying demand for capital equipment still is heavy. Backlogs have not altered much since the market break; chances are that they won't in the near future. More than that, the pile-up of orders for consumer goods is strong. These factors augur well for metalworking.

An across-the-board shift to buyers' markets, however, may come sooner than anyone thinks. In many commodities, the changes are here now. Others are on the verge of a shift. But this turn-around from a seller's market does not mean that a decline in business is on the way.

Prices Not Up Uniformly

Prices of raw materials have not risen uniformly; and that fact may result in readjustments in some items and not in others over a prolonged period. Steel has gone up 35% since 1940, for instance, whereas copper and brass are up 78% and lumber 215%.

Some manufacturers are holding down costs in several ways: (1) substitution of materials wherever feasible; (2) better ordering and scheduling; and (3) use of cheaper and better product-designing suggestions made by suppliers.

Sheet Deliveries Improve

Though sheet and strip steel demand still far surpasses the supply, deliveries are slowly improving. Tonnage shipped is nearer the amounts ordered by customers and reaches the user closer to the time requested. The feeling is that if the government will allow voluntary allocations to work, as at present, for railroad car, farm implement, petroleum and housing needs, steady improvement is assured. But Washington compulsion is something else. It probably would result in retarding recovery because of cumbersome red tape.

New sheet mills are coming in gradually, in some cases being delayed by the scrap situation and by retarded construction of blast furnaces and open-hearths.

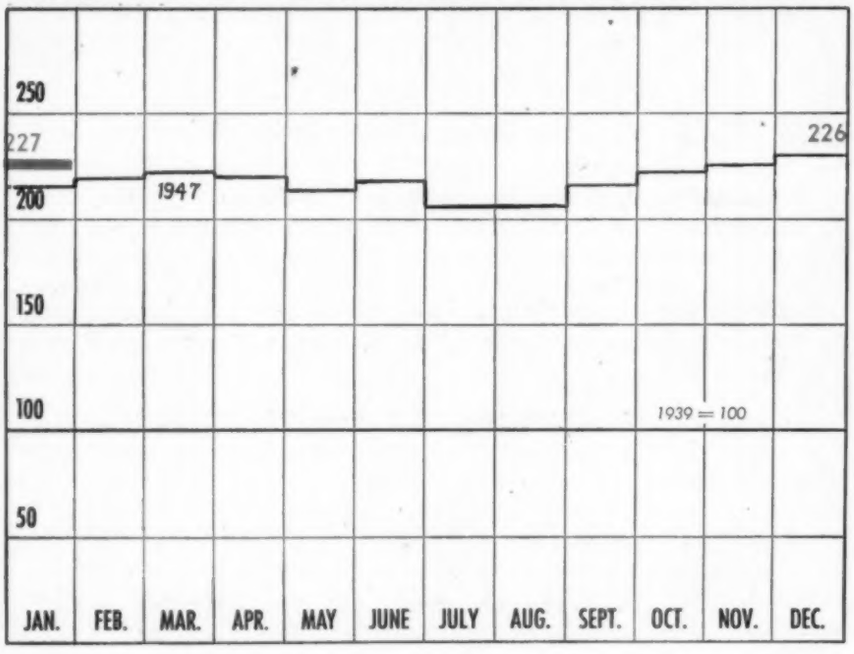
Scrap "Traded" For Steel

Large steel users continue to "trade" scrap for delivery of near-normal quotas of finished steel. Instead of selling scrap at fancy, premium prices in the open market, they are shipping it to their steel suppliers at the going market rate. In return, they receive generous tonnages of steel also at the regularly-quoted prices.

Certain important consumers are holding inventories rigidly to four-weeks' requirements, which is a bare minimum. By midsummer, the strip and sheet steel situation should be greatly improved.

Structural steel will be tight for months. More of it is being used because of the heavy construction program this year. The only cheerful

American Machinist METALWORKING INDEX



American Machinist Index Of Metalworking Production

(1939 = 100)

	January 1948	December 1947	January 1947
Total	227	226	216
Machinery	248	247	234
Electrical Machinery	242	245	243
Autos and Trucks	238	235	207
Transportation Equipment	294	293	309
Other Metalworking	156	156	151

(Note: The index is based on manhours worked)

sign is that big users are not having to resort so much to warehouse purchases and to "conversion" orders. Plates will stay critical during the second quarter.

Gray Iron Castings Scarce

Gray iron castings, thanks to the pig iron scarcity, are on the hard-to-get list. They are likely to stay there most of the next six months. Many foundries have had to curtail operations because of the situation.

Steel and non-ferrous castings are relatively easy to get. They are expected to continue that way. Both steel and non-ferrous foundries have increased prices up to 10% recently.

Copper Demand Heavy

Demand for copper is heavy. It exceeds domestic output by 20,000 to 35,000 tons a month. The shortage can be made up comfortably from foreign sources if buyers will continue to purchase only what they need. The copper situation will be upset only if excessive government buying or free shipments under ERP develop.

Aluminum promises to get worse before it gets better. All makers are flush with business. No relief is in sight. Only chance of improvement is a letdown in demand. Current tightness is not due entirely to use of aluminum as a steel substitute; increased production of parts which naturally should be made of aluminum is partially responsible.

Freight Car Output Up

Freight car builders soon will achieve their long-sought goal of 10,000 units a month. And that will be the beginning of the end of the freight-car shortage. It appears now that this year will not bring a repetition of last year's desperate situation. Enough new cars are being built to more than replace those being retired. New cars, too, are bigger than the old and are hauled faster.

December production was 9800 units. Weather difficulties pulled January assemblies down to 9000. Retirements have been about 7600 a month. It will be sometime, however, before car supply returns to normal. The average car today is 21 years old; for over 10 years prior to 1939, more cars were taken out of service each month than were built.

Machine Tool Orders Brisk

The year has opened with fairly brisk machine tool orders. And inquiries continue in unusually high volume. Good business has been booked by some builders from the automobile industry, traditionally a good source of buying. Much foreign business is pending; it will not be shaken loose until ERP is put into effect and a way is found to include machine tools. It is too early to tell yet whether the devaluation of the franc will seriously affect French purchases of U.S. machine tools. Meanwhile, many builders are examining carefully the possibilities of expanding their sales in Latin America.

Index Hits New Peak

Moving up one point, the American Machinist Index of Metalworking Production staved off the depressing effects of the break in the commodity markets. The January Index went to 227, one point over December and 11 points above the corresponding month in 1947.

In the components, Machinery advanced one point to 248, Electrical Machinery dipped three to 242, Autos and Trucks lifted three to 238, Transportation equipment advanced one to 294 and Other Metalworking held at 156.

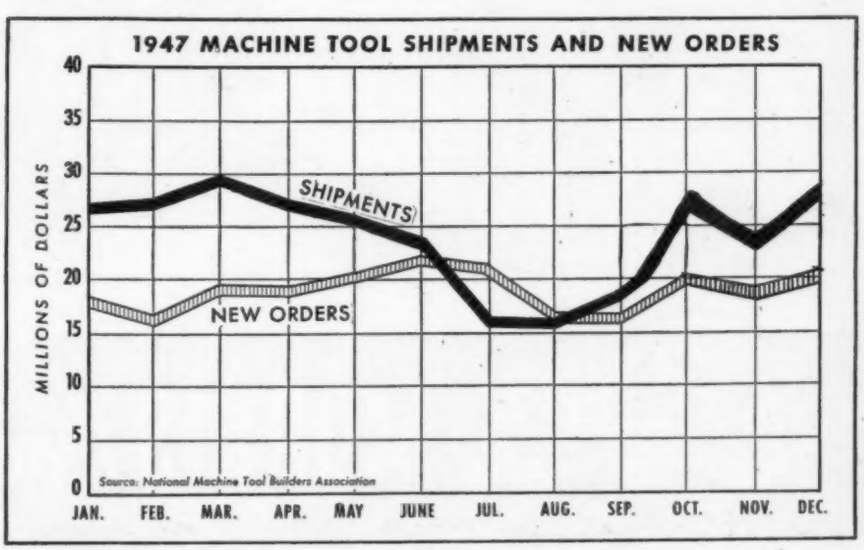
Shipbuilding Gets Boost

Orders for 18 tank ships to U.S. shipyards have brightened up a gloomy side of metalworking. At the close of 1947 only 22 orders were on hand for ocean-going craft and all but six were to have been completed by the middle of 1948.

The orders for tankers will temporarily keep alive national shipbuilding and help shipyards to maintain a nucleus of a trained and skilled staff.

Still to be completed by American shipyards are 37 steel merchant vessels and more than 200 miscellaneous commercial craft of more than 100,000 gross tons. Included in this latter group are ferries, trawlers, towboats, tugs, dredges, derrick boats, fireboats, drill barges, hopper and cargo barges, acid and oil barges.

During 1947 43 ocean-going vessels were completed in American shipyards and this compares favorably with pre-war production figures.



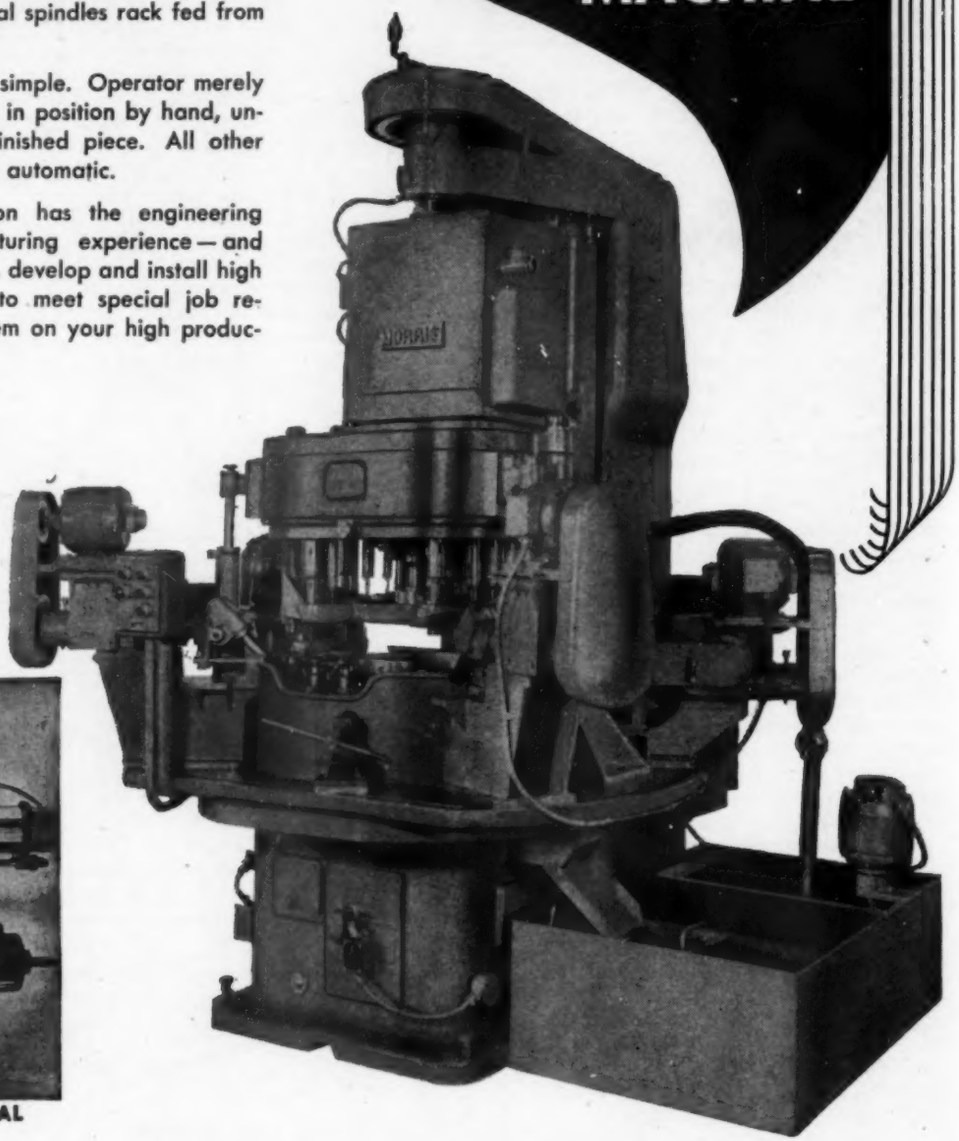
MORRIS
MOR-SPEED
Six-Station
Vertical Hydraulic MACHINE

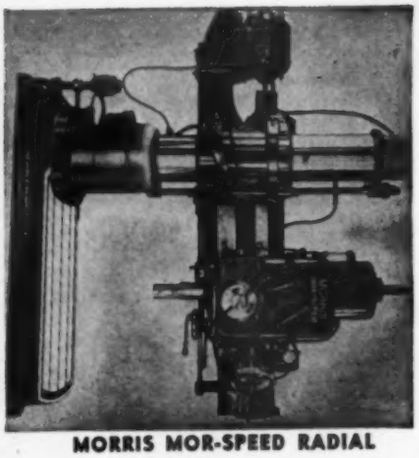
● To adequately handle the required production of a specific job, many manufacturers find Morris Mor-Speed machines not only capable of meeting production requirements but also exceptionally economical in operation.

An interesting example is the Morris machine shown. This vertical type machine, with hydraulic automatically operated indexing fixtures, drills — reams — counterbores — countersinks and chamfers holes in various positions in Refrigerator Compression Cylinder parts. There are thirty-one vertical spindles driven by a hydraulic unit and eight horizontal spindles rack fed from the hydraulic unit.

Operation is extremely simple. Operator merely loads and clamps work in position by hand, unclamps and removes finished piece. All other operating functions are automatic.

Tne Morris organization has the engineering "know how"—manufacturing experience — and shop facilities to design, develop and install high production equipment to meet special job requirements. Consult them on your high production jobs.





MORRIS MOR-SPEED RADIAL

Builders of MOR-SPEED Lines

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Why Trifle With Your Future?

The time to cut production costs is now. The manufacturer who waits until he is in the middle of a buyer's market is going to be in a tough position.

More manufacturers already are in that uncomfortable position than one thinks. Bitter experience the past year has proved that the change from a seller's to a buyer's market can be disconcertingly rapid.

Take radio receivers as a shining example. No longer is there a terrific pent-up demand. Retail store windows are full of radios. Competition, in price as well as in brands, is back with a bang.

Consumer resistance to radio prices is apparent. If the industry wants to keep demand at a high level, it must offer lower-price sets. And that's exactly what it is doing. The new models will be substantially cheaper than the old.

To make possible this change in prices, manufacturers have been compelled to do two things. They have had to redesign their products for more economical production. They also have had to pare factory costs.

With today's labor rates what they are, individual companies are accomplishing their purpose by installing new machines, by handling materials and parts mechanically and automatically instead of by hand, by arranging their shops so that parts, subassemblies and assemblies flow freely and uninterruptedly down production lines.

The greatest productivity per manhour is the ultimate objective, because that is the way to squeeze down unit costs. Prices can be lowered only if unit costs are minimized.

What is happening in the radio industry is merely the curtain-raiser for similar developments in other metalworking industries. The competitive price "urge" will come in time. It may not arrive next week or next month, or even in six months. But it is a safe guess that it will be upon most industries by some time in 1949. The break in commodity markets will help to speed up the day.

How prepared are you for the coming of that day? Is your plant bulging with outmoded equipment or have you been astute enough to replace it with new, cost-reducing machinery?

What are you doing to cut down the expense of moving materials from one spot to another? If materials-handling comprises 25% of your costs now, why don't you take action to get it down to 20% or 15%?

Now is the time to equip yourself against the day when you must have low costs if you expect to stay in business against stiff competition. The management which chooses to wait until the crisis arrives is trifling dangerously with its future security.

Burnham Finney

EDITOR

* Demonstration at Machine Tool Show, Chicago.

CARBIDES PAY ... with the CINCINNATI TOOL LIFTER ...on CINCINNATI SHAPERS

The rigidity that dampens vibration; the power for the toughest steels; the speed for thrifty carbide performance—all are found in Cincinnati Heavy Duty Shapers.

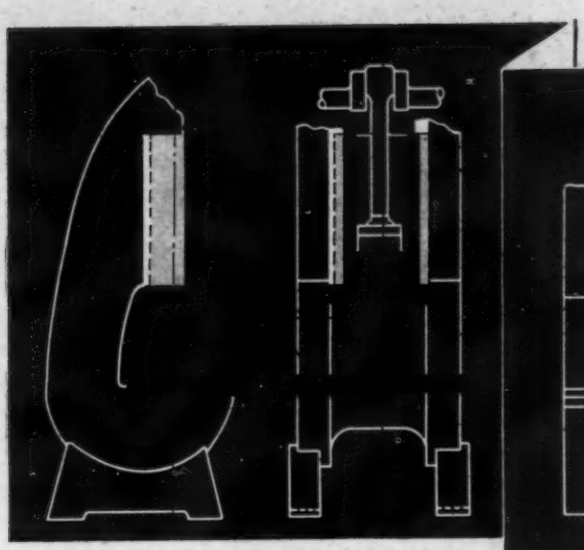
Whether it's alloy steels, chilled castings, chipper blades, or glass molds—carbides on Cincinnati Heavy Duty Shapers are cutting manufacturing costs.

*This Cincinnati Shaper, equipped with a Cincinnati Tool Lifter and carbide tools, operated steadily at 200 strokes a minute at the Machine Tool Show in Chicago. During this ten-day demonstration the shaper was producing a superior finish—quickly and efficiently—on Heppenstall grade B die blocks.

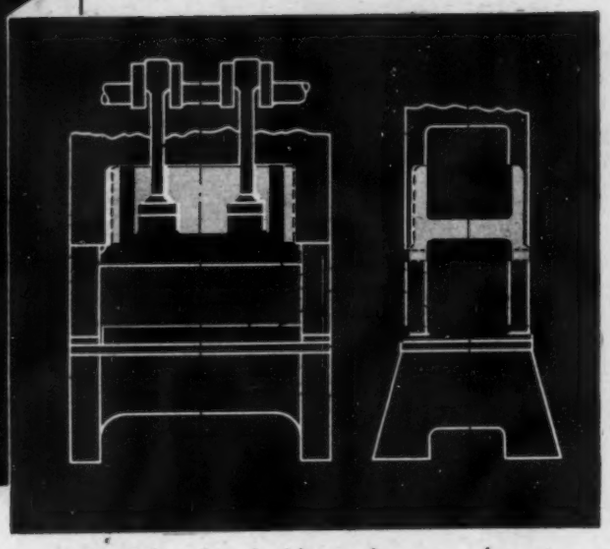
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



1 *Ram face and bed face of C-frame inclinable press are plane surfaces parallel to each other. Ram motion, neglecting deflections under load, is at right angles to the bed, maintaining parallelism during the press stroke*



2 *Straight-side double-crank press has two cranks used for reciprocating motion to minimize deflection on the large slide area. Face of ram and bed are parallel plane surfaces and, neglecting deflection, remain parallel during stroke of the press*

How to Get the Most Out of Punch Presses...I

C-FRAME PRESSES

BY E. H. GIRARDOT, PUNCHING TOOL & DIE DIV., GENERAL ELECTRIC CO.

POWER-PRESS production has long been recognized as largely responsible for reductions in selling price of apparatus utilizing pressed parts. Only recently, however, are power presses assuming their rightful place as precision production tools.

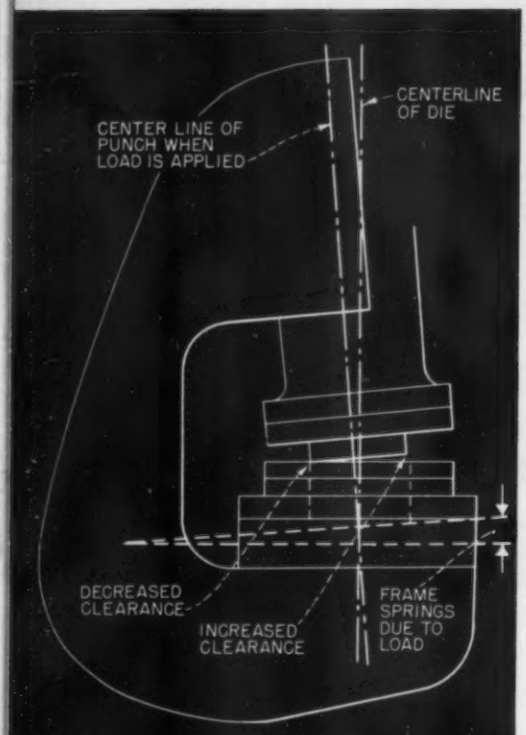
Reasons for this belated recognition are not too readily apparent, except that the simplicity of the common punch press, as compared to the complexity of its special tools, has kept attention focused mainly on tools and dies. It has been the general belief that these machines, composed essentially of a reciprocating slide carried in a substantial frame, operate in a theoretically correct manner.

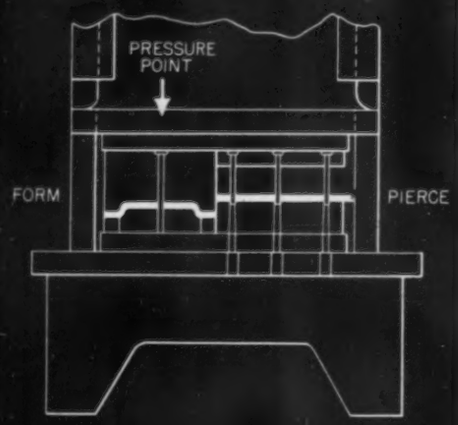
The constant trend toward closer tolerances on production parts, in addition to inconsistent performances of the same dies when run in different presses, led to investigations which indicated that the mechanical condition of the press is a vital factor in efficient operation. As in all modern machine tools, rigidity is the outstanding requirement for precise and economical performance.

The term "rigidity" as applied to punch presses, however, is subject to considerable misunderstanding. Many press users apparently believe that a press should exert its rated tonnage with no springing or bending of the press sections. If this were true, the press would operate in a theoretically correct manner, and absolute rigidity would be attained on jobs within the press range.

Actually, of course, steel and iron deflect under load. This is often overlooked because of the rugged appearance of the punch

LONG die life and accurate parts both depend on good mechanical condition of the punch press. An extensive study of presses resulted in the improved methods presented in this series of six articles


CENTERLINE OF DIE
CENTER LINE OF PUNCH WHEN LOAD IS APPLIED
DECREASED CLEARANCE
INCREASED CLEARANCE
FRAME SPRINGS DUE TO LOAD



press. Deflection in solid-frame presses cannot be eliminated, nor can it be eliminated in the bed, ram, or crown of straight-side presses assembled by means of tie-rods. In the latter type of press, deflection is eliminated in the side members, because they are maintained in a fully deflected condition through the force exerted by shrinkage of the tie-rods.

"Rigidity" must then be considered as a relative term in reference to the work to be done and the load required to do the work, as related to the rated tonnage in the press chosen. Although press deflection will remain below the elastic limit of its materials when exerting full rated pressure, it is obvious that the amount of this deflection would be much smaller if only a portion of the rated pressure is used. It is also obvious that this deflection must be considered when choosing a press for a particular job.

Effect of Deflection

On bending and forming work, the deflection may not make any difference, and the full rated tonnage may be used. On very accurate cutting dies, however, it is a certainty that the life of the die would be greatly reduced if it was run in a press which it would load to capacity.

In addition, cutting work induces another condition injurious to the cutting edges of the die, called "break-through." Press deflection (as well as spring in the work and play in the moving parts) causes the punch, at the instant of fracture, to break or snap through the remainder of the material and into the die at high speed. The severity of this condition is proportional to the amount of press deflection in the particular application.

All die designs, from the simplest single-station die to the most complicated progressive and slide-action dies, are based on the theory that the punch and die members will maintain parallelism and will not shift in relation to each other during the operating cycle. Experience has proved that accurate, clean-cut blanks can be consistently secured if proper clearance is provided between the punch and die. Because the recommended clearance is approximately 6% of the material thickness on each side, a clearance of only 0.0015 in. is used when cutting 0.025-in. material. It is evident that only a slight misalignment of the punch and die under cutting pressure would take up this clearance, and allow the cutting edges of the punch and die to assume a metal-to-metal fit at some point around the die contour, doubling the clearance at another point.

Fig. 1 illustrates the principle of the common C-frame type of single-crank press. The ram face is a plane surface at right angles to the ram ways. Bed and bolster are also plane surfaces, and ways in the frame are so aligned that the ram will reciprocate exactly at right angles to these surfaces. In this manner, the ram face and the top of the bolster maintain a position parallel to each other at any point in the ram stroke.

Fig. 2 illustrates the principle of a double-crank straight-side press. It is essentially the same as for single-crank presses except that, due to the area of the ram, two cranks are used to provide the reciprocating motion. In place of a solid frame, most double-crank presses utilize sectional frames held securely together by four tie-rods, one located front and rear on each side.

Records kept of runs on plain compound dies for rotor and stator punchings showed variations in performance that were not readily explainable. For example, one die gave runs of 45,000 punchings, when set up in two different presses. Furthermore, a varying dimensional discrepancy between the actual die and the blank sizes produced from it was noted. In most cases, the blank was from 0.001 in. to 0.005 in. smaller than the size of the hole in the die. This indicated a possibility that the die was sagging, or "closing in" under cutting pressure.

Rebuilding Doubled Die Life

One press was completely dismantled and rebuilt within very close limits. The original 4-in.

bolster was replaced with one 6 in. thick, with a minimum size of scrap hole. A real improvement in die performance was noted in this reconditioned press. The same die which had produced up to 45,000 punchings per grind now produced 90,000 punchings before an objectionable burr condition was reached. It was also noted that the rigid combination of rebuilt press and new bolster operated with little noticeable vibration, being much smoother and quieter than before.

Other similar presses not reconditioned showed comparatively severe vibration and undue noisiness at the instant of breakthrough. Another noticeable indication of lack of rigidity showed up in the "pumping" of air and cutting lubricant from between die and bolster, bolster and bed, and even from between the joints of the straight-side press sections and the bed. The latter indicated either a stretch in the tie-rods or that they were improperly adjusted.

The comparison of the rebuilt press with others of the same capacity on the same work proved forcibly that, although the inherent deflection in a press is a major factor causing excessive die wear and troubles, the mechanical condition of the press is equally important, or more so.

A tentative routine for inspecting presses for mechanical condition and misalignment was established and the following results and conclusions were found for C-frame presses. (The procedure for other types will be covered in subsequent articles.)

C-Frame Presses

Deflection under load in this type of press is in the form of an arc, tending to straighten out the C-frame. This changes the relation of the ram face and bolster from parallel under no load to angularity under load. Since cutting dies are set up in the press under no load, this deflection necessarily changes the relationship of the punch and die members. In the case of a blank die, the die clearance decreases at the rear of the die and increases at the front (Fig. 3). On forming or stripping operations, the dies are pinched tighter at the back than at the front.

Control of this condition, which is detrimental to die life, particularly on cutting dies, lies in proper press selection for the job at hand. No positive rule for a pressure ratio (tonnage required by dies as against rated tonnage of press) which would insure an economical run between die grinds can be given.

In the event of short die runs on any particular die, it is advisable to try the die in a press of the same type at least two sizes heavier before blaming the fault on poor die construction or faulty tool steel. It isn't enough to go to a press only one size larger, since calculations indicate that a 35-ton press will spring approximately 0.006 in. under full load. Calculations also indicate that the next size larger press, 56-ton capacity, would spring approximately 0.0055 in. under the same load of 35 tons. This amount of deflection would be reduced in the next larger press of roughly 80-ton capacity to approximately 0.003 in.

Permanent Set Common

The most common condition of misalignment found in C-frame presses is that of a slide motion in improper relation to the bed. An analysis of this condition indicates that the frame of the press has acquired a permanent set, due to use of a die of such design that the pressure was not balanced in the center of the die. Theoretically, both sides of the frame would be stretched an equal amount if the pressure was concentrated at a point exactly in the center of the frame.

Unfortunately, however, very few dies with the exception of round dies can be so designed that the central pressure point would coincide with the centerline of the frame. Progressive dies, combining pierce, cut-off, and form operations are particularly bad, since the form operation must necessarily come at one end of the die. The "bottoming," or setting of the form, usually requires extreme pressure as compared to the cut-

ting operation, and thus considerably more deflection results in one frame side than the other (Fig. 4). It is entirely possible that, from overloading of the press on such operations, one side may be deflected to a point beyond its elastic limit, assuming a permanent set. Obviously, once this misalignment is present, short die runs can be anticipated from any cutting die.

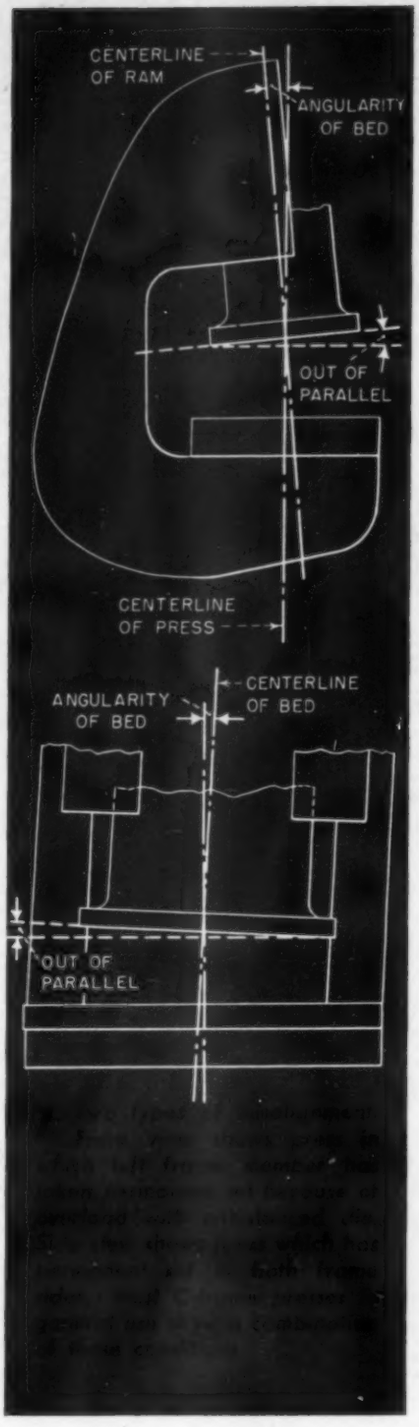
Wear of Moving Parts

Wear of the crankshaft and its bearings, and of the pitman and its bearings, does not affect alignment of the slide. The only connection to the slide is in the pitman ball, which pivots to absorb lost motion, allowing the slide to be guided entirely by the ways. Worn bearings can readily be detected through the action of the slide, which will hesitate on meeting resistance, while the crankshaft takes up the looseness before transmitting pressure.

Crankshaft and pitman bearings, once worn to a point of looseness, tend to destroy themselves with increasing rapidity as wear progresses, due to their inability to maintain proper lubrication. When idle, the crankshaft, due to its own weight and that of the parts suspended from it, forces the oil from between itself and the bottom of the bearing (Fig. 5), assuming a metal-to-metal fit at this point.

In properly fitted bearings, the oil climbs along the side of the shaft when the shaft begins to rotate where it immediately forms a film between the shaft and bearing. In the case of a worn bearing, this oil film is broken and lost when the slide meets resistance, and the shaft moves vertically to establish the pressure point at the top of the bearing, thus allowing a metal-to-metal fit under maximum load.

Excessive die wear is another undesirable result of worn bearings. The slide must be so set that the punch will just enter the die under pressure, at which time all the looseness has been taken up. At the instant of break-through the punch will then enter the die at excessive speed for a distance equal to the play in the bearings, with resultant extra die wear. Remachining of the crankshaft bearing areas and replacement of the bearings is required for reconditioning.



Bed, bolster and ram faces are checked by means of a straight edge for true plane surfaces. Usually the bed and ram face will be found in good condition, although the bolster is quite often found to have sagged in the center over the hole in the bed. Remachining the bolster restores a level condition.

The motion of the slide should be checked for angularity to the press bed, from the front of the press. This can readily be done by mounting an indicator on the slide which contacts the face of an angle plate or square strapped to the bed or bolster (Fig. 6). Reciprocating the slide will then give a direct indicator reading. Any deviation found from a motion at exact right angles to the press bed presents a condition of misalignment injurious to cutting dies. This misalignment may take one of two forms (Fig. 7), or a combination of both.

Realignment

Realignment of the slide motion to the bed presents a major problem. Shims have been used to pack up the bolster, but this method has not proven entirely satisfactory. Unless the shims cover a major portion of the contact area between the bed and bolster, they tend to "coin" themselves into the metal, thus restoring the original condition. Shims also have a tendency to jar out during operation.

Machining of the bolster in such a manner that the top surface matches the slide motion is also a possibility. This method also has drawbacks, since the bolster should then remain an integral part of the press. If it is removed for any reason, extreme care must be used to see that it is replaced in the same position. This means that other bolsters could not be used in the press unless they, too, were specially machined to suit. This defeats the advantages of interchangeable bolsters, because it is not practical to maintain a group of bolsters for one press alone.

The most satisfactory method is to rebuild the press completely, at which time the proper relationship between the ways and the bed of the press can be restored by remachining. It will generally be found more economical and just as satisfactory to recut the bed surface in alignment with the ways, rather than to recut the ways in alignment with the bed. In any event the ways, both on the frame and on the slide, should be carefully inspected and rescraped, if necessary, before the bed is remachined.

Carbide Tool Routs Fiberglas

Abrasive material and skin irritation from dust demand special tool bits and safety precautions

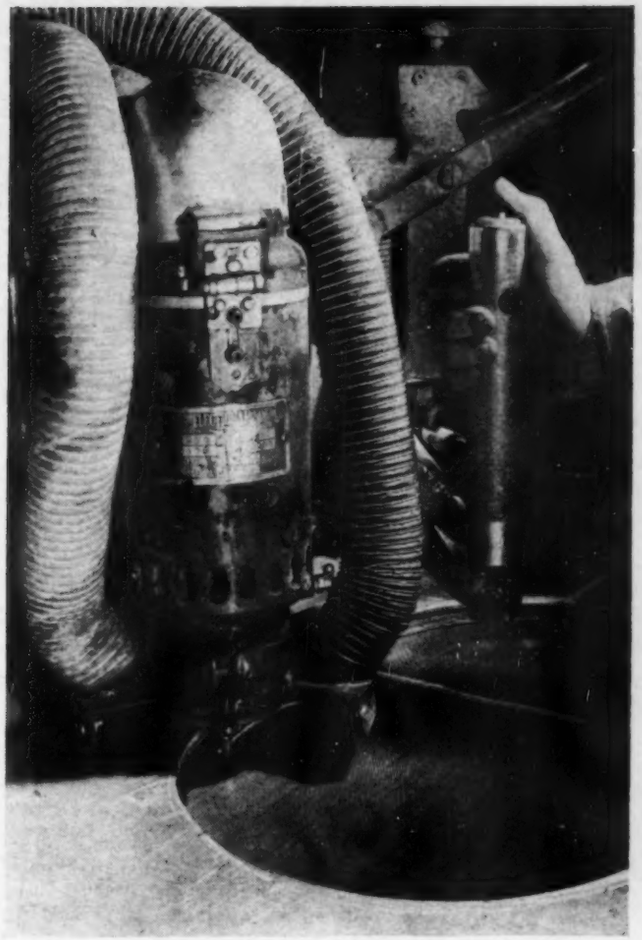
HIGH tensile strength, fairly good rigidity and other desirable properties are expanding the applications of laminated Fiberglas, a glass-reinforced plastic. In the aircraft industry, it is used for fuel-cell liners and backing boards to prevent metal from contacting rubber cells and to avoid any chafing of assemblies.

Punching and blanking of Fiberglas can readily be done by observing certain precautions in die design and press operation. Among these precautions are: Never punch holes of diameter less than sheet thickness, as the sheet may crack. Have punch and die clearance approach a sliding fit. Be sure each blank clears the die at its stroke to prevent possible lamination separation. Another recommended practice is to punch blanks slightly larger than required, then pass them through shaving dies to obtain smooth edges.

Although Fiberglas can thus be blanked successfully, North American Aviation found that its production requirements were not great enough to warrant die investment. Furthermore, certain parts, as backing boards, required internal cutouts and contour cuts which could not be made by hand methods. To meet these conditions, radial-arm routing was tried because it had been so successful under similar conditions in working aluminum-alloy sheet.

It was immediately apparent that high-speed-steel router bits would not stand up because of the highly abrasive nature of the glass particles and dust. Carbide-inserted tips were next tried, but were found to be too costly and unsatisfactory because of the difficulty in matching the insert with the helical path of the flute.

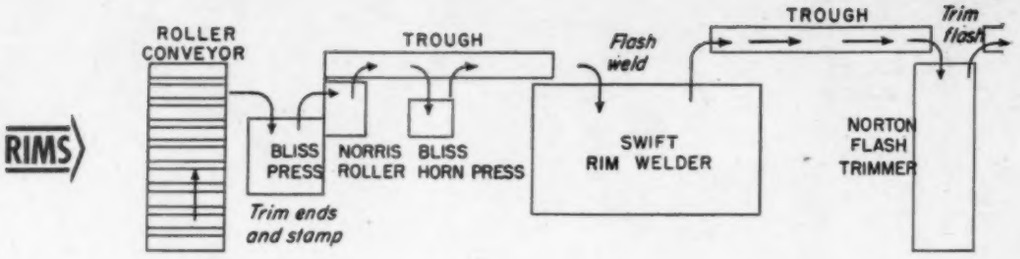
Satisfactory bits were finally made by cementing a 21/64-in. dia. solid piece of carbide into a ½-in. steel shank and grinding the flute into the solid carbide. Kennametal K4H, which is a tungsten-titanium carbide with a low percentage of cobalt binder, proved to have the required wear resistance to stand the abrasiveness of Fiberglas. One bit, for instance, has had a tool life of over 500 linear ft. on 4 layers of 1/16-in. material, and should be good for at least 300 ft. more before resharpening.



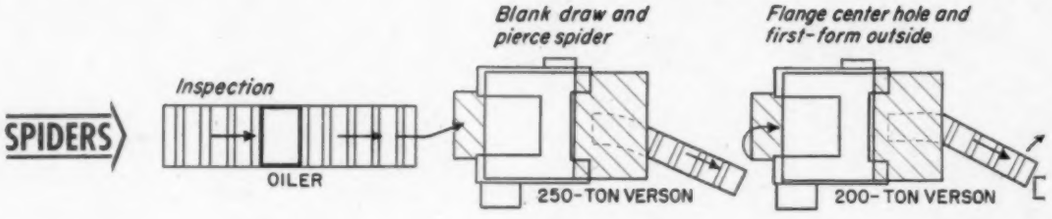
ROUTER HEAD for cutting Fiberglas has an attached suction system to prevent dust from striking operator and is equipped with a carbide-tipped bit to withstand abrasiveness of glass particles

One other problem had to be solved. Fiberglas dust irritates skin and mucous membranes. Small particles become imbedded in the skin and set up a mechanical irritation. Although penetration into the skin is slight and particles can be washed off with soap and water, the router operator should change clothes and have a shower after a day's work. Long sleeves and a face shield are desirable.

To prevent as much dust as possible from reaching the operator, North American has arranged an exhaust system on the router head. Two flexible 2-in. tubes, attached to a collector collar, carry dust particles to a cyclone unit. The collector collar has a rubber foot that comes into contact with the router pattern and forms a pocket around the bit as the Fiberglas is routed. Its front opening, while small enough to give good suction away from the operator's face, still provides good visibility of the cut.



MECHANIZED HANDLING EASES



Requirements of efficient wheel manufacture are met in correlated plant layout and materials-handling methods, plus excellent die design

BY HARRY S. WHAREN, ASSOCIATE EDITOR

TO CONVERT from jobbing to line manufacture, to produce high-production parts at a profit, faced Norris Stamping and Manufacturing Co. on its entry into automotive work. Before the war, Norris was principally a job stamping shop, but its war work, particularly in ordnance, impressed strongly on the company the importance of plant layout and mechanized handling.

To meet competitive prices on automotive parts, and yet make a profit, demands more than the facilities and equipment needed to make the parts. It demands acceptance of a philosophy of manufacturing entirely apart from jobbing technique. It demands a layout, and means of creating the layout, that insure a minimum of backtracking and handling and a maximum of uninterrupted flow of materials from raw stock to finished part.

From raw stock to shipped wheel, every possible effort has been made to mechanize part movement and to eliminate worker fatigue and indirect labor costs. Handling 400 wheels per hr. can mean a heavy handling bill and a waste of press-operator time if between-press movements are not planned for operator convenience and minimum bending, stooping and stretching on his part.

Conveyorizing the flow of parts between machines not only contributed to more economical manufacture, but also served to store parts in process. Clearing the floor then permitted placing of machines closer together, shorter conveyors and more systematic correlation of floor area allocated for the job.

By recognizing the inter-dependency of materials handling and plant layout, by determining materials-handling requirements, by planning the layout to provide the needed handling facilities and by adjusting the plans to machines, men and operations, Norris has attained a smoother, uninterrupted flow of materials and components from receiving to shipping department.

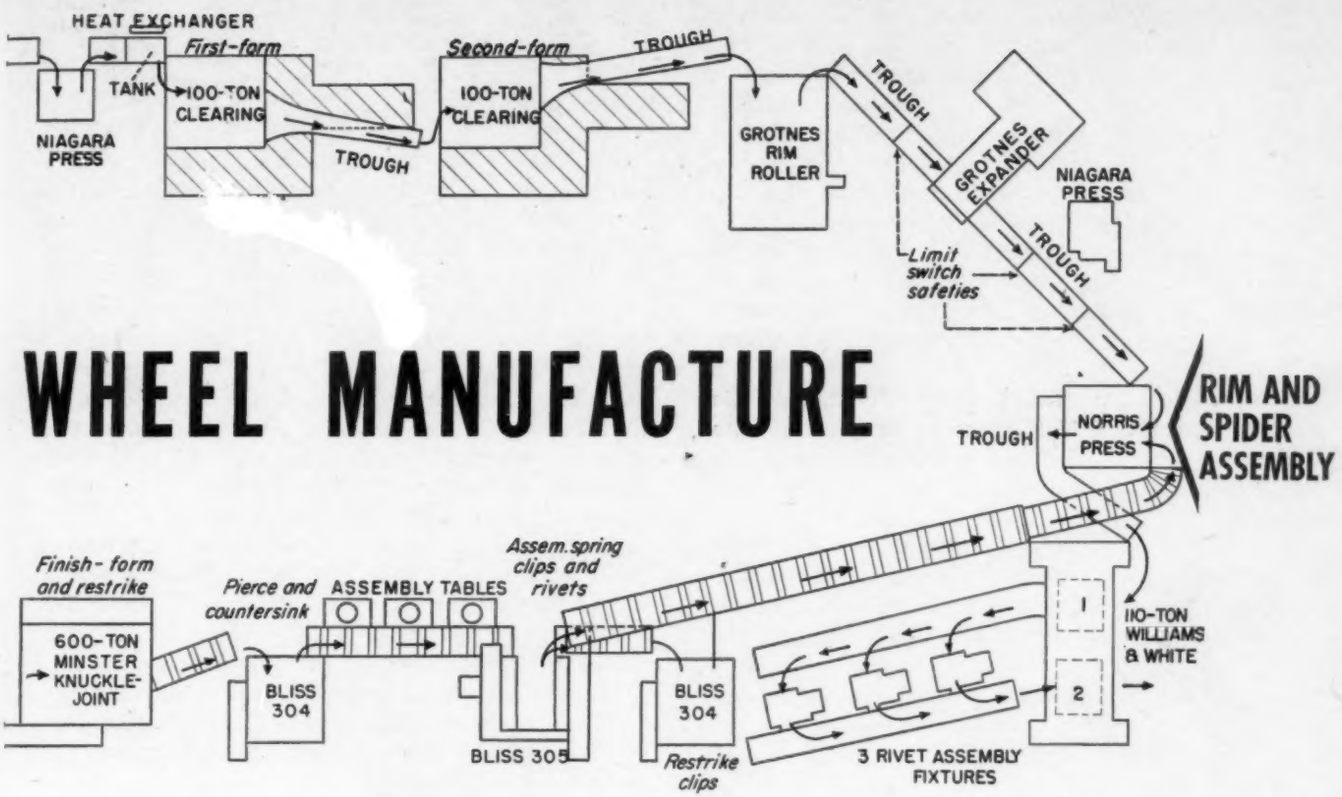
Automobile wheels are made up of two parts—rim and spider, pressed and riveted together. Rim and spider stock, hot-rolled low-carbon steel 0.125 and 0.130 in. thick, is sheared to approximate length and pickled to prepare the surface for further processing.

Stock is spray pickled while passing through a Metalwash pickling machine equipped with a roller conveyor. Sheets are stacked on work carriers having vertical pins that hold sheets on their edges so the pickling solution can be directed against both sides of each sheet. From the exit end, carriers are returned to the loading end on a live roller conveyor running parallel to the machine.

The pickling operation is carried on in four stages: (1) 2½ min. in 20% sulphuric acid held at 180 F.; (2) 1 min. in cold-water rinse; (3) ½ min. in a sodium chromate rinse also held at 180 F.; and (4) 9 min. in a gas-fired dryer.

Rim stock, trucked to the press department, is loaded on a roller conveyor adjacent to a Bliss press

WHEEL MANUFACTURE



PRESS-LINE LAYOUT for automobile wheel manufacture at Norris Stamping and Mfg. Co. routes rims and spiders down two adjacent lines with components finally assembled and riveted at the right end. Conveyors and slides carrying parts between operations provide maximum operator convenience and minimum work handling

at the head of the rim line. In this press, both ends of the rim blank are trimmed to insure straight edges for the weld.

As the line layout was designed to eliminate, as much as practical, any manual handling between and during operations, this press is tripped automatically by the stock hitting two limit swtches located at each end and at the rear of the press bed. Both ends are sheared at the same time.

The operator, by making a quarter turn, passes the trimmed blank through a Norris-designed roller that forms it to its circular shape. This machine has three forming rolls and two guide rolls.

As the blank is rolled to circular shape, its leading edge engages a hooked slide that operates a limit switch. The switch, by closing a relay circuit, operates a solenoid that causes the air-operated ejector to move out and push the rim into a sheet-metal gravity trough.

The rim rolls to the next press in which its ends are flattened over a horn to speed up welder loading, replaced in the trough to roll to the welding machine and there flash welded.

The welded rim then rolls in a trough to a Morton trimmer which machines off the outer and inner faces of the weld in one operation. The rim is slipped over and locked on a horizontal arm in which is mounted a slide carrying the tool that trims the inner face of the weld. The tool that trims the outer face is carried in a slide in the head of the machine. One pass inward, similar to the action of a draw shaper, faces the weld flush with the sheet-metal surfaces.

The rim rolls by trough to a Niagara press in which weld ends are trimmed and by another trough into a tank of soluble oil that both cools the rim still hot from welding and lubricates it for subsequent press work. Lubricant is continuously pumped through an adjacent heat exchanger that has a cold-water coil to cool the solution.

The operator of the next press, a 100-ton Clearing, lifts the rim from the bath and hand-loads it into a preform expanding die. This first stretching shows immediately whether the butt weld is acceptable, because any defect means a split weld and ruined work.

To speed up the operation, the rim is centered automatically. Then as the ram rises, side fingers engage the upper rim edge flared in the preform, strip the rim off the die and hold it suspended until the operator pushes it off with the next part.

The rim falls on a sloping side of the trough leading to the following press and is turned on its edge to roll to another 100-ton Clearing in which it is final formed in a second expanding die. It is ejected in the same manner as in the first Clearing press and rolls to a Grotness rim roller for rolling to final shape but not necessarily within tolerances.

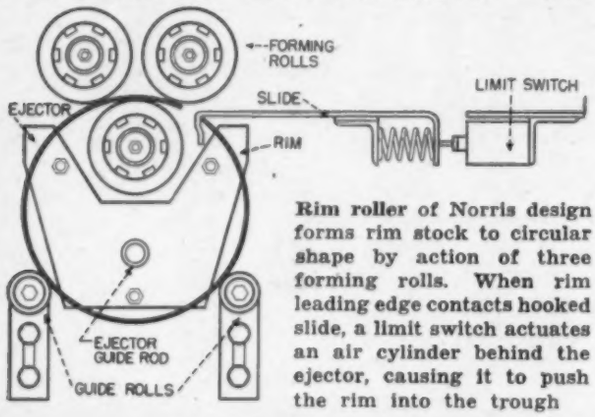
Final sizing to tolerance is done on a Grotness expander. The rim is fed into the expanding die automatically. Limit swtches, actuated by the rims, are provided in the troughs leading to and from the machine, so there can be no jam up in the die.

The die is set horizontal in the Grotness expander. As a rim rolls into place, one die half is advanced toward the rim by cam action. Both parts of the die consist of ten wedge-shaped segments or expanders, cap-screwed to an equal number of cam blocks. A center cone then feeds out and forces the die expanders to move radially outward and bring rim dimensions within specified tolerances.

To prevent wear on the S.A.E. 1035 cam blocks and a consequent change in rim size, wear plates of oil-hardening tool steel are doweled and cap-screwed on their inner surfaces or are doweled and held in place by retainers.

The rim, now formed to final shape and size, rolls by trough to a No. 14 Niagara press in which the valve hole is pierced opposite the weld line. The rim is then replaced in the trough to roll to pre-assembly.

Blanks for wheel spiders are trucked, the same as rim stock, from pickling and placed on a roller conveyor at the head of the spider line. An operator at this station gages their thickness, picks out the better side of the stock and runs blanks through an oil roller to coat them with a medium-grade machine oil.



Rim roller of Norris design forms rim stock to circular shape by action of three forming rolls. When rim leading edge contacts hooked slide, a limit switch actuates an air cylinder behind the ejector, causing it to push the rim into the trough

First press operation, on a 250-ton Verson, is a blank, draw and pierce in a double-action die. The stock locator on this die is actuated by a limit switch operated by the formed spider sliding out at the rear over projecting arms. A second limit switch is arranged to make the press inoperative until the scrap clears the die.

The blank is hand fed and, after forming, ejected through the die to a roller conveyor leading to a 200-ton Verson in which the center hole is punched. The spider is again hand-fed and ejected, as in the first Verson, to another roller conveyor leading to a 600-ton Minster knuckle-joint press. Here it is finish formed and carried by conveyor to a No. 304 Bliss where five bolt holes are pierced.

Operations on the spider here vary according to make of passenger car, with either hub-cap spring clips being attached or hub-cap bosses formed. The latter operation is performed in a No. 305 Bliss in which bolt holes also are coined.

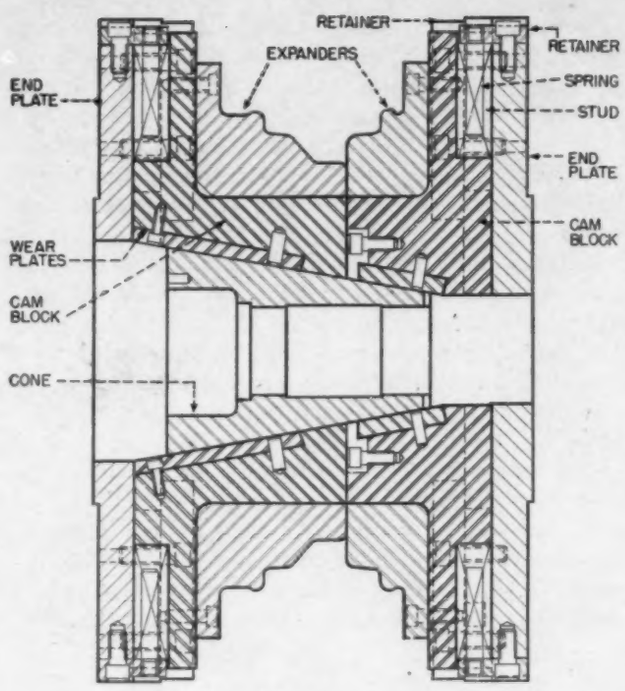
The die is a single-action unit in which auxiliary motion is obtained through cam-actuated slides. Five coining punches, spaced around the central part of the die, coin the bolt holes into an equal number of die buttons.

At the same time four cams, cap-screwed to the punch holder, force the sliding die section inward toward the center of the die. Tool-steel punch inserts in the sliding sections form the four hub-cap bosses in the spider. When the ram rises, the sliding sections are withdrawn by spring pressure.

Corresponding die inserts in the punch into which the bosses are formed by the punch inserts have

FLASH-WELDED RIM has weld faces machined flush on a Morton trimmer. I.D. facing tool is carried on a slide mounted in the stationary horizontal arm while the O.D. facing tool slides within the upper arm. One draw stroke trims both faces

RIMS after welds are trimmed roll into a solution of soluble oil kept cool by circulation through a heat exchanger next to the oil tank. Press operator lifts rim from tank, pushes off previous rim from lifting fingers into a trough behind the press and loads the rim into the expanding die where it is given its initial form



FINAL FORMING AND SIZING of rims are done in a Grotness expander. Each die half is made up of ten wedge-shaped expanders cap-screwed to ten cam blocks to which are doweled and screwed wear plates on their internal surfaces. One die half, advancing into the rim, causes it to center over the outer stationary die half, and a center cone forces die expanders out to size it. As the cone is drawn back, a spring on each expander retracts it to permit halves to withdraw and release rim

compression springs that act downward and inward toward the center. As the punch rises, the vertical springs prevent the sliding retainers and die inserts from rising with it until the coining-punch retainer rises far enough to engage the cutouts in the sides of the sliding retainers and die inserts.

The horizontal springs then force retainers and inserts toward the center, a distance equal to the depth of cutouts. This is sufficient to allow the spider to drop from the punch as bosses are released from undercut inserts.

Spiders are then carried by roller conveyor to a Norris-designed preassembly press for press-fitting into rims. A spider is loaded on the die, a rim is placed over the spider and the two are pressed together. The wheel is then ejected, by a flip arm attached to the front of the ram, to a trough behind the press.

It rolls in this trough to a 100-ton Williams White press having two stations. In the first station, twelve rivet holes are pierced and countersunk in the wheel which is then ejected by lifting fingers to a roller conveyor leading to rivet assembly.

Rivets are set by hand into an air-operated fixture, the wheel is placed over the fixture and the rivets are driven into the holes punched in the previous operation. Carried by roller conveyor to the second station in the Williams White press, the wheel has rivets headed in a die similar to the rivet-hole piercing die.

The piercing die has twelve rivet punches mounted on the die and toggle-arm operated. The wheel is placed in the die with the spider supported on the nest ring and the rim on eight rim locators. When the press is tripped, the punch assembly ring contacts both rim and spider as the pressure ring bears on the rivet-punch retaining ring.

Continued downward movement of the punch against the air-cushion pressure on the die causes toggle arms to swing down on their inner ends, forcing rivet punches horizontally through rim and spider into button dies.

The button dies also are moved horizontally,

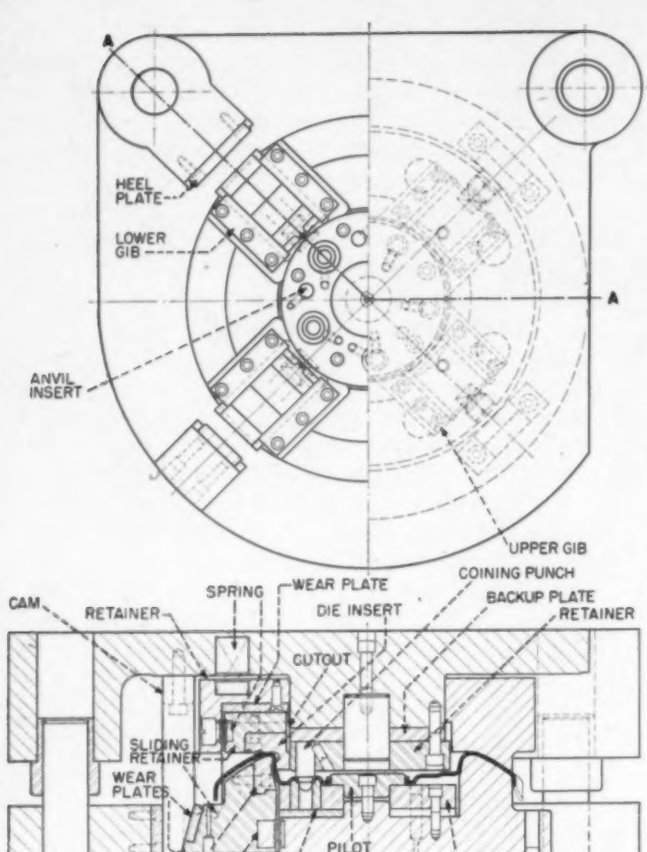
FINISH-FORMED SPIDERS are carried by the roller conveyor on the right from the bolt-hole piercing press. At this press, bolt holes are coined, hub-cap bosses formed and finished spiders are placed on the conveyor at left leading to assembly. Auxiliary motion of dies is obtained from cams mounted on the punch

but outward toward the punches, by a central cam punch working against inner surfaces of the four segmental die holders. Punched slugs drop through slug tubes to a slug pan beneath the die.

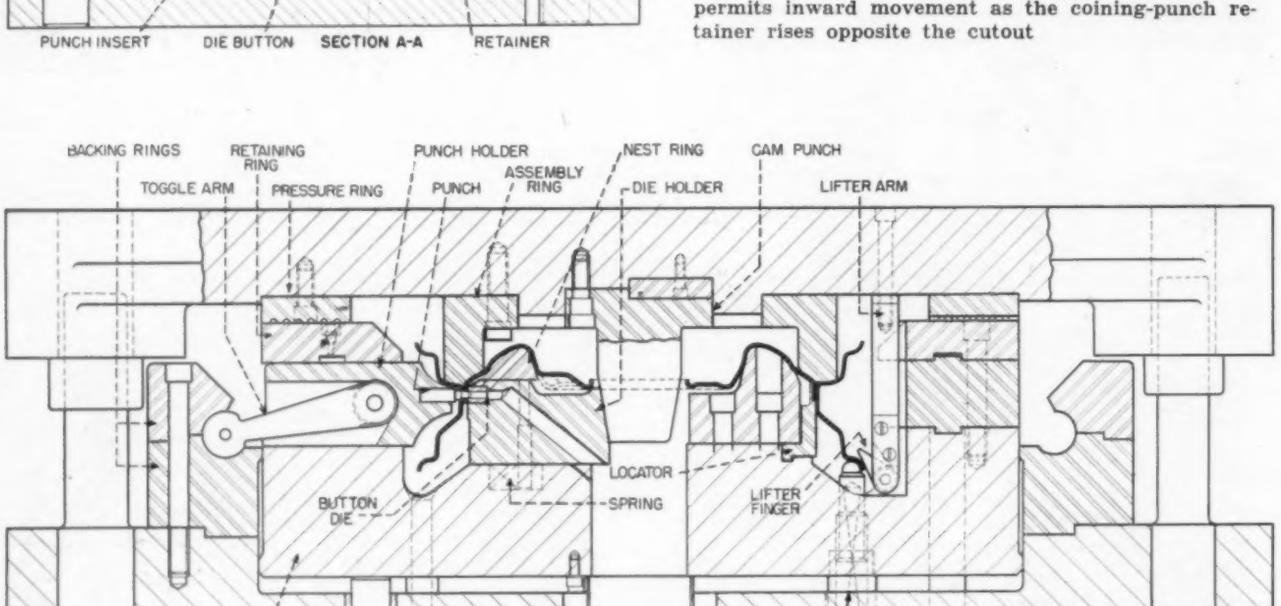
As punch and die rise, rivet punches and button dies withdraw, permitting four lifting fingers to strip the wheel off the die and hold it suspended until pushed off on a roller conveyor leading to inspection. Here the inspector gages concentricity at four sections, and checks internal diameter and valve-hole location.

If wheels are to be shipped without paint they are oiled in a tank trough and picked up automatically out of the oiling slide for delivery to shipping.

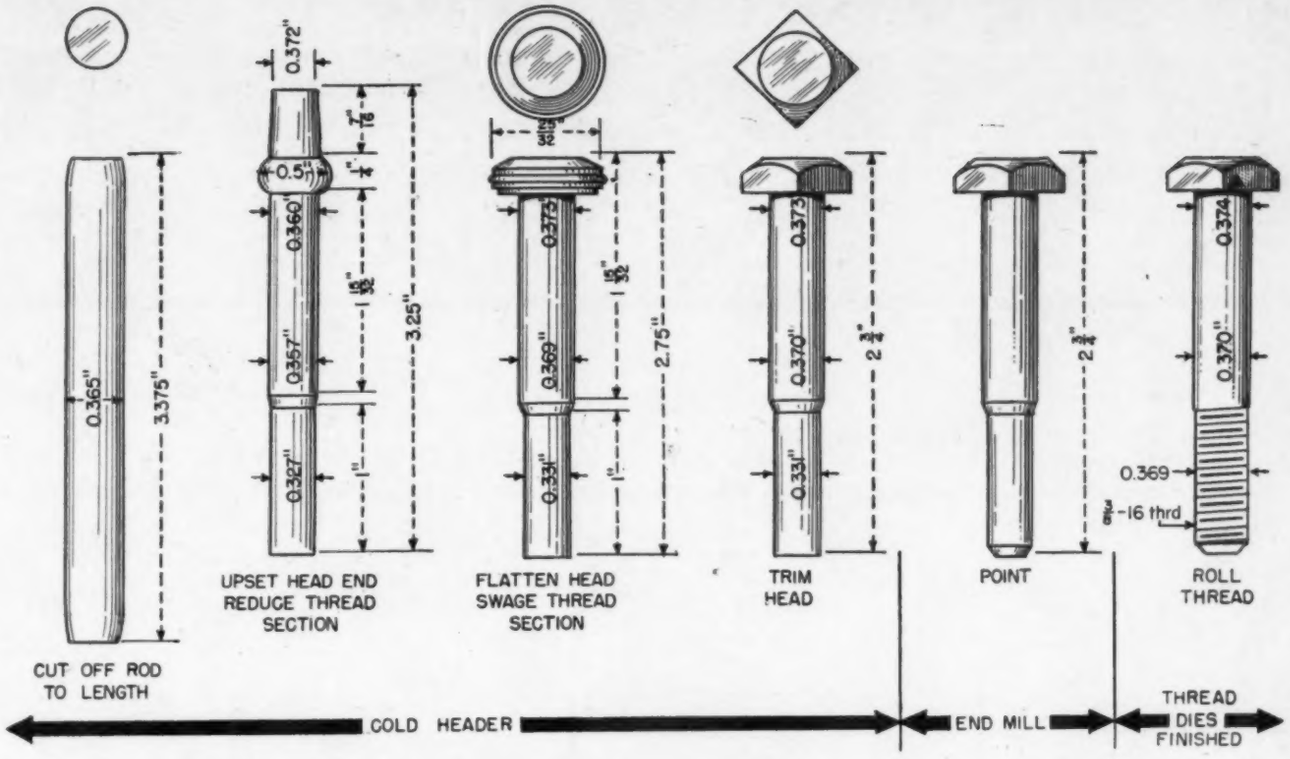
Other wheels are loaded on an overhead monorail conveyor and carried through a spray bonderizing unit, dry-off oven, cooling tunnel, paint dip tank, gas-fired overhead bake oven and finally to shipping. On the loading dock, they are transferred to portable gravity conveyors for loading into box cars.



BOLT-HOLE COINING AND BOSS FORMING DIE has five coining punches set into the central retainer. Hub-cap bosses are formed by four cams forcing an equal number of sliding retainers carrying punch inserts radially inward. The finished spider is released from the punch by spring pressure that holds die inserts down and forces them inward as the punch rises. A cutout in sliding retainer and die inserts permits inward movement as the coining-punch retainer rises opposite the cutout



RIVET-HOLE PIERCING DIE has twelve rivet punches actuated by toggle arms as their punch holder is forced downward by the pressure ring on the punch. At the same time button dies are moved outward toward the punches by a central cam punch contacting sloping internal surfaces of die holders. The pierced wheel is stripped off the die by four fingers spring-mounted on ends of lifter arms



Typical stages in making a bolt in a cold header are: Cut off stock, preliminary upset, final upset and extrude shank to size, trim head, point with end mill, and roll thread

Cold Heading Cuts Manufacturing Costs

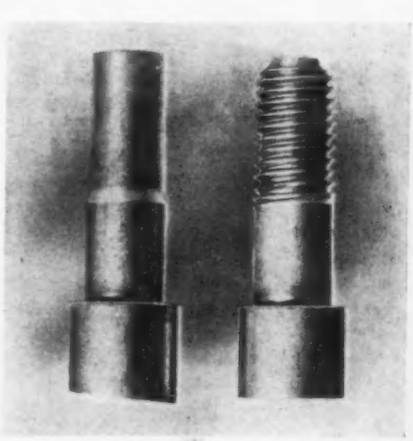
Replacing screw machine or milling operations by cold heading can effect over 50% material and labor saving

By CHESTER S. RICKER
Detroit Editor, American Machinist

COLD heading assumes an important place in any program of cost reduction, because it not only reduces the number of higher paid manhours, but also promises a very large saving in material costs. Within certain limits of shape and size, great economies can be obtained; these justify, in many cases, redesign of the product to enable the process to be used.

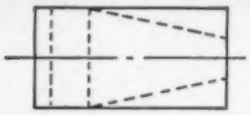
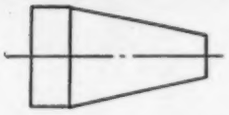
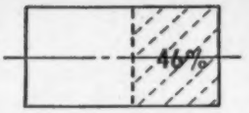
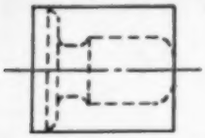
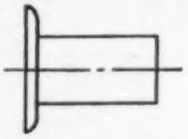
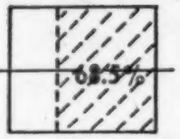
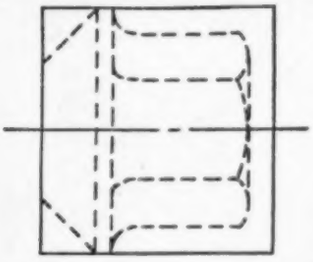
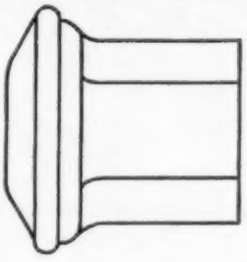
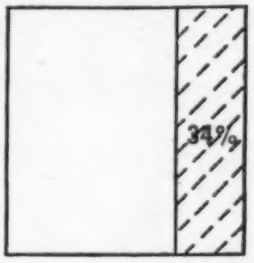
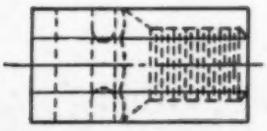
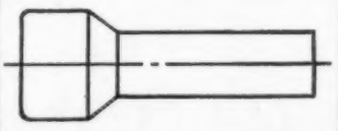
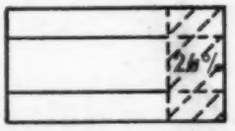
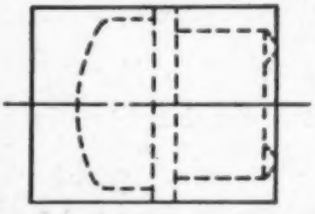
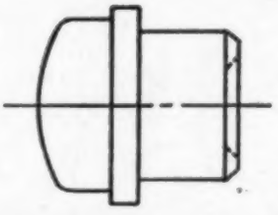
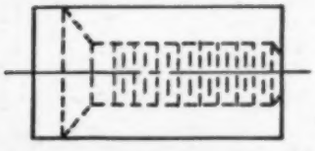
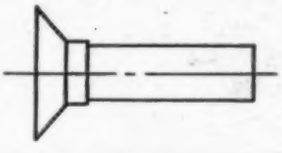
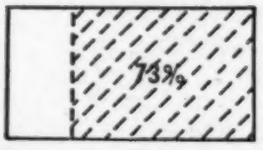
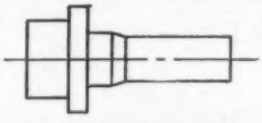
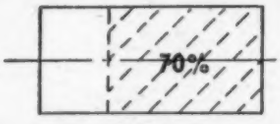
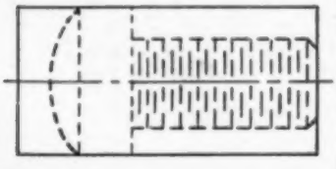
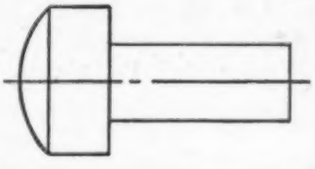
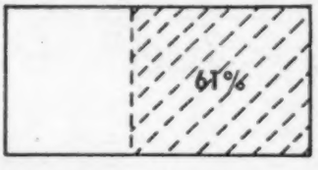
Briefly, articles machined from bar stock employ material of the dimensions of the largest cross-sectional area of the part. Against this, articles made by cold heading normally start from material of the diameter of the shank, and the larger sections are upset from this. Tremendous amounts of material can thus be saved.

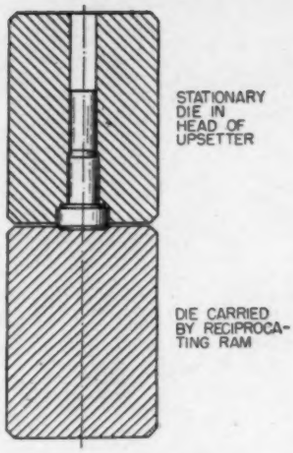
Production rates are extremely rapid, and where finishing operations are required, automatic or semiautomatic machines are usually employed. The volume of deformed material is limited to about four diameters of stock. For example, if the article is to be made from ½-in. dia. stock, the diameter of the head, collar, or other deformation should not exceed about 2 in. Maximum length normally lies between 6 in. and 8 in., although in certain forms of cold heading the length can be limitless. The final limitation is that small quantities cannot be produced economically, because cold heading methods require quantities of 15,000 to 100,000 pieces adequately to absorb the cost of spe-



Two major steps in making capscrews. Left, the blank as formed in the cold header; right, the finished screw with thread rolled and head trimmed to finished size

TYPICAL PARTS PRODUCED BY COLD HEADING

SCREW MACHINE PRODUCT	COLD HEADED BLANK	MATERIAL	MATERIAL SAVED	LABOR SAVED
		Copper	 46%	98.8%
		Steel	 62.5%	50.0%
		Steel	 34%	Released 500 milling machines
		Steel	 26%	66.0%
		Steel	45%	50.0%
		Steel	 73%	83.3%
		Brass	 70%	93.4%
		Stainless	 61%	None



Cross-section of a typical die, showing simplicity of design which helps reduce manufacturing costs. Cavities can be machined at each end to permit die to be reversed when one end becomes oversize; this doubles die life and reduces costs

cial tools and setup time.

Frequently, however, tooling cost can be reduced by using standard tools to produce special parts. Even with intricately shaped parts, tool cost is lower than that of form-turning tools for screw machines, or special cutters for milling.

Maximum size of pieces produced by cold heading is approximately 1-in. dia. of shank and 7 in. long, but parts up to ½-in. dia., cold headed at one end only, can be of much greater length. The upset can be at the end of the part, or in the form of a collar at almost any point on the shank. Normally, all upsetting is to a round or oval shape concentric with the shank, although some forms may be slightly eccentric. The upset can be sheared to many other forms by trimming. In most cases, round, square or hexagonal forms are used, but this is by no means a limitation, as in certain cases the upset has been trimmed to form gear teeth and similar intricate shapes.

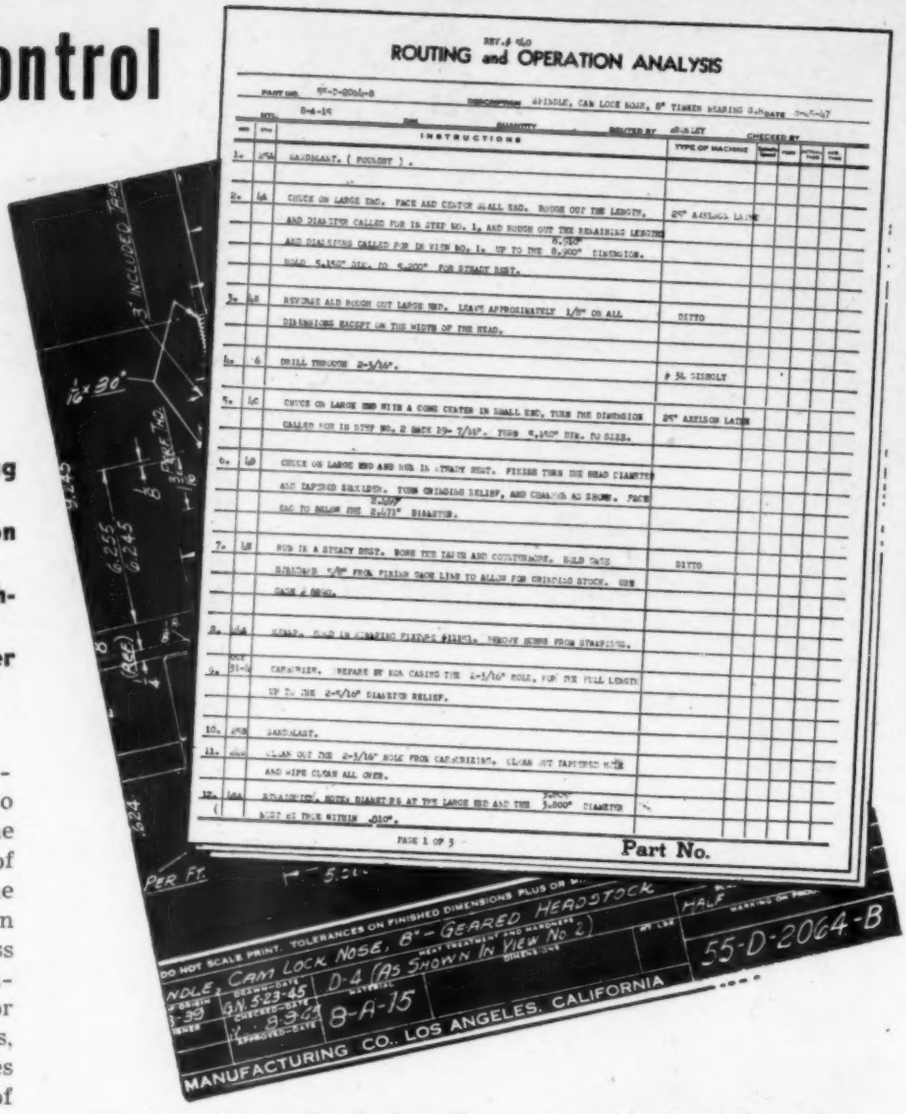
Many cold-headed parts require threads, and almost without exception, it is the practice at National Screw & Mfg. Co. to roll rather than cut these. Thread-rolling developments in the past decade have been such that rolled threads are usually more accurate than cut threads. The operation costs less in manhours, the thread is stronger because of cold-working of the metal; and the burnished surface is superior to that produced by cutting. As accuracy in thread rolling depends essentially on the diameter of the blank, tungsten carbide dies are used for upsetting where extreme accuracy is required. Class 3, or better, threads can be obtained in this way.

Cold heading is applicable to virtually all common metals, and many alloys. Some may require annealing or spheroidizing to prepare them for cold heading, but it is not difficult to cold head carbon steels up to about SAE 1045, alloy steels containing 0.40% carbon, or under, several of the stainless steels, brass, bronze, monel metal and most of the alloys of aluminum and copper. Gold and silver screws and rivets are also frequently produced by cold heading.

National bolt-making machine capable of handling steel up to 1-in. dia. Bolts are produced complete, including chamfering the end and rolling the thread

Simplified Control Reduces Paper Work

Requisition, blueprint and tag combine to control production effectively, yet simply and without a staggering mass of paper


ROUTING and OPERATION ANALYSIS
INSTRUCTIONS
TYPE OF MACHINE
PAGE 1 OF 3
Part No.
DO NOT SCALE PRINT. TOLERANCES ON FINISHED DIMENSIONS PLUS OR
SPINDLE, CAM LOCK NOSE, 8" - GEARED HEADSTOCK
55-D-2064-B
MANUFACTURING CO. LOS ANGELES, CALIFORNIA

Routing and Operation Analysis Sheets, prepared by the routing and analysis department, describe all operations to be performed on parts being processed. The sheet, in this case that for a lathe spindle, is attached to, and issued with, the blueprint to production departments as their guide to methods and tooling

"REDUCE paper work to a minimum and tighten controls to a maximum" is the slogan of the production-control department of the Axelson Manufacturing Co. The problem is to control more than 6,000 production orders in process at a time, in various stages of completion and varying from parts for 6 sizes of heavy-duty engine lathes, about 11 sizes in three or four types of oil-well pumps and a group of aircraft units, ranging from 30 to 600 parts per assembly with tolerances from 0.005 to 0.0001 in. or closer. The only plausible answer is iron-hand control.

Each unnecessary piece of paper that can be eliminated steps up efficiency and reduces cost of production. Emphasis should be placed on the word "unnecessary," because prudence dictates a certain number of records and reports in any production-control system.

There is the ever present danger that production control may degenerate to the level of mere follow-up of shortages for assembly which are discovered far too late. Or even worse, it may become mere record keeping—every company has a battery of clerks for that purpose.

Production control should embody each of these more or less incidental details. But if it is control, it must be essentially a method that will make management planing work out as projected.

In planning and installing the production-control system, every effort was made to keep it as simple as possible and, at the same time, to avoid the common dangers of over-simplification. It has now been tested so thoroughly that Axelson knows it works, even though products are diversified and production orders heavy.

When the management decides, for example, on the size and quantity of its lathe schedule for a given period, instructions are given to the production-control department to carry out the program. A planning list is prepared by engineering and presented to inventory (stock) control, which prepares manufacturing requisitions.

To these requisitions are attached the correct blueprints. Watch this print because it is one of the three pieces of paper that control the whole production story of a part.

From the manufacturing requisition, the production order, or "tag", is written, copies of which are sent to the cost-accounting department. Blueprint and tag are now sent to the routing and analysis department where experts make a careful, detailed study of each job.

They prepare for each part a routing and operation analysis sheet the describes all manufactur-

Blueprints and Routing Sheets are held in the production-control office between operations and placed in allotted cubicles to indicate machine loading. Prints issued to production departments authorize the drawing of tools from cribs and processing of parts. Prints must be returned to process control after each operation

Flow Charts, maintained in production control to afford a visual progress record, are posted when blueprints are returned to the office. Posting after each operation keeps charts up-to-date, shows rejects and progress

ing operations to be performed in their proper sequence. For instance, the cam-lock nose spindle for the 20-in. lathe requires 39 operations, including sandblasting, turning, drilling, reaming, tapping, boring, carburizing, straightening, milling, grinding, degreasing and inspecting. Instructions for each operation are in detail, so there can be no question on procedure, dimensions or the type of machine for the operation.

In this department also, a box stamp is placed on the back of the blueprint so it can be used as a follow-up record. The box includes space for tag and schedule numbers, operations, quantities and inspector's initials for signing out after each operation.

Follow-up Board Records

The tag number is recorded in the box and the print, tag and analysis sheet are sent to the follow-up office. Here the job is recorded on the follow-up board and all three papers are sent to the raw-materials department.

From the print, the raw-materials man knows what material and quantities to issue. The tag is charged on its back for the material and the issue recorded by cost accounting. The tag is placed with the material which it follows until it reaches the stockroom and is recorded as complete.

After the proper entry is made in the box showing the quantity of pieces issued and the operation department to which the material is to be sent next, the print and the attached analysis sheet are sent to the production follow-up office.

The production-control clerk enters on the board the quantity and the operation to be performed and turns the print over to the machine loader who decides which machine is to do the work and places the print in the cubicle that bears the machine number involved.

Before the machine is ready for the material, the foreman of the particular department sends the departmental helper to the production-control office for the next job up. He obtains the print, takes it to the tool crib, receives the necessary tools and delivers material, tools and print to the operator.

When an operation is completed, all parts are rigidly inspected and counted, and the print is signed by the inspector in the box stamp, showing quantity and next operation to be performed. The tag is likewise signed out, so any rejection can be allocated to a particular operation.

After each operation, the print is returned to production control for posting and reassignment. This insures that a record is kept of the parts progress through the shop, as well as any possible change in quantity because of rejection. By using the blueprint as the essential control of the product, both follow-up and quality control is made more certain.

Subassembly Flow Charts

A simple set of flow charts, arranged by subassembly groups to show parts behind schedule, are kept up by one daily report from final inspection, showing parts accepted for stock, and one daily report showing any special reductions from stock affecting production.

Two vertical lines on these charts indicate shipments and "shooting quantity." The former is reported daily and the vertical string moved appropriately. The latter is moved weekly as directed by the head of production control.

These flow charts indicate the urgency of the need of parts. In event of overload or overscheduling for a given operation, the machine-loading man, simply by taking prints to the outside manufacturing department, instructs it to place certain lots in the hands of vendors.

TALKING SHOP

Plantkeeping

AT EATON SCREW PRODUCTS, Eaton, Ohio, good housekeeping is a prime rule of management. This is a contract shop, specializing in automatic screw-machine products, and has five Acme Gridley multiple-spindle screw machines, a Warner & Swasey turret lathe, a small Logan lathe with turret attachment, a small hand-milling machine and several tool grinders. Machines and walls are painted light green and the concrete floor is painted gray. Everything is done to keep the entire shop clean and sparkling. As a consequence, owner Justice says he specializes in taking difficult jobs, particularly where small lots or tolerances within a half-thousandth are required. Part of the answer to his success may be the idea instilled in the men that the plant should be kept clean. Neatness soon spreads beyond floors and machines.

Extruded Stainless

IN EXTRUDING STAINLESS steel tube, International Nickel Co. uses twin carbide dies alternately. Alternate use permits the dies to air cool between passes, in contrast with normal water cooling of steel dies.

Tailor-Made Bearings

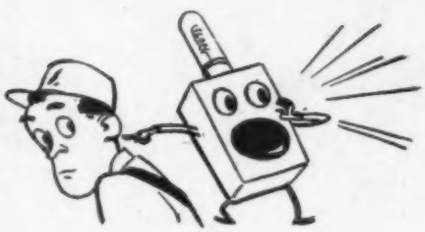
ENGINEERS can benefit by developing new anti-friction bearing requirements within the general plan of standard boundary dimensions, according to A. S. Murray, assistant chief engineer, SKF Industries, Inc. Wide adoption of standardization would simplify production, reduce delivered cost and speed deliveries.

Friendly Oil

HYDRAULIC OIL in machine tools should be checked at reasonable intervals. If the quantity involved is 25 to 30 gal. or more, it will probably pay to send a sample to the plant laboratory for analysis. If the neutralization number has risen above 0.5, it is a good bet to replace the oil, according to experienced maintenance men. If the quantity is smaller, throw it away rather than risk gumming or corrosion of the hydraulic circuit. Remember—color and feel mean little. It is cheaper to throw away a few dollar's worth of oil than to tie up a $10,000 machine for repairs. In larger machines, never add hydraulic oil to the sump, unless you have evidence from the supplier that the used and new oils are compatible.

Union Time Studies

AN UNUSUAL ELEMENT of the profit-sharing plan at Apex Electrical Manufacturing Co. is the use of union-recommended, company-trained time-study observers who continue their union affiliations. These men make stop-watch studies and elemental breakdowns after watching a number of operations. Before becoming effective any timing has approval of the standards department head, the foreman in charge of the operation, the union representative, and finally the operator. This multiple approval has proved neither unworkable nor altruistic. In 10 months, 1984 standards were set. Of these 1700 were accepted, 284 rejected by operators, 213 of these negotiated and accepted after minor revisions, 20 accepted later without negotiation and 51 filed. The latter were on short-run operations which will be renegotiated when jobs are run again.



Catcher

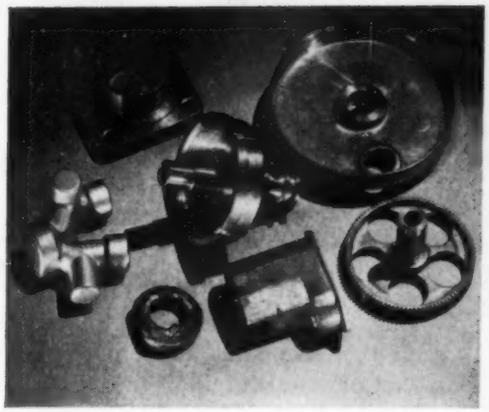
OCCASIONALLY men are tempted to run machines through cycles without work in place in order to increase the total on the cycle counter installed on the machine. One instrument maker now has developed a counter responsive to the peak electrical load required to machine the piece, so that if the machine is operated light the counter will not record. Further, recorders are on a panel board in the foreman's office — thus the foreman controls setting of the counters and hourly production can be recorded if desirable.

Sealing Tapes

BRIGGS, MURRAY AND FISHER are now all using extruded sealing tapes that can be applied between auto body flanges spot-welded together. The tape is melted enough by welding temperature to flow by capillary action into the gap between the individual welds. This assures complete sealing and rustproofing of joints. Presstite Engineering Company, St. Louis, which makes the material, claims it will neither harden nor crack and that priming of surfaces before welding is not necessary. Also wind laces are not required at exposed coach joints.

Aluminum Again

APEX is using cast aluminum cases to replace cast iron for gear cases on all models of washing machines. Tubs formed from rolled aluminum sheet are also being used on one model. Rolled aluminum avoids pitting in service. Baked enamel surface is applied to the exterior only. The aluminum tub and gear case lighten the machine by 15 lb. and boost the price $5 to $10, but no buyer resistance has been encountered.



How to Finish Copper and Copper Alloys

BY THE SUBCOMMITTEE ON FINISHING COPPER ALLOYS, THE AMERICAN SOCIETY FOR METALS*

R. W. BELFIT, *(Chairman)*, SCOVILL MANUFACTURING CO.

WM. E. BAULIEU, BRIDGEPORT BRASS CO.

E. W. LOVERING, SEYMOUR MANUFACTURING CO.

B. H. McGAR, CHASE BRASS & COPPER CO.

Photographs courtesy of Scovill Manufacturing Co.

PARTS made from copper or copper alloys are legion. Ordnance material, electrical goods, plumbing goods, novelties, hardware, heat exchangers, fastening devices of many kinds, even the lowly dressmaker's pin, are made of such materials. And such parts may be screw-machine products, forgings, stampings, castings or headed products.

Somewhere during processing, these parts are bound to pick up oxides and soil (greases, oils, drawing compounds, dirt) which must be removed before the next fabricating step or the application of decorative finishes. This article outlines the methods and practices used in industry for deburring, polishing, buffing, cleaning, pickling, surface preservation and decoration. Metals to which the information applies are copper, brasses, special brasses, aluminum bronzes, silicon bronzes, phosphor bronzes, manganese bronzes, nickel silvers and copper-nickel alloys.

* The technical data presented herewith represent a chapter "Finishing of Copper and Copper Alloys" in the forthcoming 1948 ASM *Metals Handbook*.

Mechanical Cleaning and Surface Conditioning

Barrel Deburring

Small cut parts, such as disks, eyelets, cups and the like, often have a sharp edge with a burr. Small articles are deburred inexpensively by barrel tumbling. Two types of barrel are used: an open-end, oblique barrel that may be tilted for unloading; and a cast-iron, horizontal, polygonal barrel with removable tight-fitting cover. Tilting barrels have four or more ribs inside to aid in procuring the desired rolling action.

Deburring procedure varies for different sizes, weights and shapes of workpieces. Experiments must be conducted to determine the preferred size of the load in the barrel, speed of rotation, time in the barrel, and abrasives and chemicals that may be used. Generally, a typical procedure starts with cleaning to remove oil.

Cleaning and Deburring Small Copper-Alloy Articles

Equipment — A horizontal, octagonal cast-iron barrel or an obliquely tilting steel barrel with narrowed mouth and centrifugal dryer.

Materials — Caustic-soda flakes, sodium cyanide eggs, No. 2 pumice, sea sand, soapbark, and cream of tartar or substitute.

Procedure

1. Add hot water to cover 50 to 250 lb. of work; add approximately 5 lb. caustic soda and 4 oz. sodium cyanide (poison).

2. To remove oil, roll for 10 min. at approximately 30 rpm.

3. With water piped to mouth of barrel, wash the parts until they are free from alkalies; that is, until red litmus paper no longer turns quickly blue. (Operators sometimes judge by elimination of slippery feel.) In oblique barrels, the parts are washed during rotation.

4. Add 3 lb. of No. 2 pumice and 6 lb. of sea sand (screened through 40-mesh) with a cover of water.

5. Roll until burrs are removed from workpieces. The time may vary from 2 to 24 hr.

6. Dump the work into a perforated centrifuge basket and wash free from abrasive.

WATER ROLLING produces a bright finish on copper parts

7. Dry the work in a centrifuge equipped with a hot air blast. Work will have a smooth, dull matte finish.

Remarks — The abrasive used may be different grades of pumice, rottenstone, sea sand, silex, emery, aluminum oxides, silicon carbides or similar materials. Sometimes, when the workpieces are heavy, satisfactory deburring is accomplished simply by rolling the parts in an oblique barrel with water only. Also, the oil may be removed by other alkaline cleaners.

Bright or Water Rolling

Equipment — Obliquely tilting steel barrel with narrowed mouth and centrifugal dryer.

Materials—Caustic soda, sodium cyanide, and cream of tartar or substitute.

Procedure

Operations 1, 2 and 3 for bright rolling are similar to those for deburring, or the workpieces may have been deburred already.

4. Add about 6 oz. cream of tartar to 20 gal. water and roll at 30 to 40 rpm. until the desired bright finish is obtained. It is usually necessary to replace the dirty solution with clean water and more cream of tartar.

5. Rinse with running water for 5 to 10 min. while barrel is rotating.

6. Dump work into a perforated centrifuge basket, place in heated centrifuge and dry.

Ball Burnishing

Equipment — Horizontal barrel made of wood, steel with wood lining or steel with brass lining; or oblique, tilting stainless-steel barrel.

Materials — "Neutral" soap, cream of tartar or a substitute, and soapbark.

Procedure

1. Work should have been deburred or bright rolled, then treated by "bright acid dipping,"

before being placed in the barrel for ball burnishing.

2. For each volume of work, add two volumes of steel burnishing balls, 1/16 to 1/2 in. diam.

3. If using the preferred horizontal barrel, fill with water to within a few inches of cover and add approximately 2 oz. soap per gal. If the water is hard, add a water softener first or a proprietary mixture that includes a wetting agent.

4. Roll at approximately 30 rpm. for 6 to 48 hr., depending on luster required and the kind of workpieces.

5. Dump contents of the barrel and riddle out the balls while washing the parts.

6. Dry work by rolling for about 20 min. in a horizontal wooden barrel that contains sawdust slightly moistened with Stoddard solvent to prevent fine sawdust from adhering to the work material.

7. Riddle sawdust from the work.

Remarks—Ball-burnishing produces the highest luster that can be obtained in bulk finishing. Such burnishing may be applied to copper alloys before plating or lacquering, or may be used after plating to improve the luster. In ball burnishing, the soap acts as a lubricant, so the metal surface is rubbed (peened) by the hardened steel balls that are marketed for that specific use. When balls are not in use, they should be kept in a soap solution or other alkaline solution to prevent rusting.

Steel shapes other than balls, such as cones, pins and slugs, are sometimes used with balls for special-shaped items, since balls cannot reach into sharp corners.

Wheel Polishing

Equipment—A buffing lathe and glue pot with temperature controlled at about 160 F.

Material — Cotton cloth-buff sections (18 in. diam.), felt or sheepskin leather wheels, high-gel-strength hide glue, and emery or aluminum oxide (80 to 220-grain).

Procedure

1. Glue together 8 to 12 sections of the cloth wheel (20 pieces of cloth to each section). Brush glue solution all over one side of each section and stack the sections while they are centered by a temporary 1-in. arbor. Compress the sections beneath about 20 lb. of weights and allow 12 hr. or more for setting. The cutting face of the wheel will be 1 to 1½ in. thick.

2. Mount the wheel on the spindle where it is to be used, and dress with a well-worn hacksaw blade.

3. Size the cutting face with a solution of approximately 25% hot hide glue, and dry at least ½ hr.

4. Apply glue solution at 160 F. to the face of wheel.

5. Roll wheel in abrasive until it has picked up all the grain it will hold. Then dry for 1 hr.

6. Repeat operations 4 and 5, but allow overnight drying.

7. True the wheel with a file sharpened to a chisel edge.

8. Crack the wheelhead by striking the face lightly with a round bar at about a 45° angle. Repeat around wheel so that series of "X" cracks are formed. These cracks make the wheel more flexible and retain the grease better, making possible a more uniform and higher polish.

9. The wheel is ready for polishing at approximately 2500 rpm. A stick of polishing tallow should be used on the wheel to lubricate the cutting.

Remarks — The most popular abrasive is 150-grain. Wheels may be set up with abrasives and glue applied on wool felt or sheepskin leather. Felt wheels are much more costly, are generally used only where a shaped wheel or bob (for inside polishing) is desired. Sheepskin wheels are used on parts that are round and irregular, if a more flexible wheel is required.

Light polishing and deburring are also accomplished by the use of a cotton cloth wheel and a greaseless composition. This type of composition, with glue as the essential binder of various abrasives, is sold in stick form. When the stick is placed in contact with the revolving wheel, some of the compound coats the cutting surface and may be used almost immediately. For polishing effects, the most suitable speeds are 4300 to 5700 sfpm.; that is, 1800 rpm., with a wheel 9 to 12 in. in diam.

Belt Polishing

Many polishing operations are performed on endless canvas or leather belts set up with abrasives

AUTOMATIC buffing equipment greatly reduces the cost of this otherwise expensive operation, particularly when the workpieces lend themselves to mounting in revolving chucks. Wheels are easily set to the desired angles, so that every part of the work surface can be buffed

IN PLATING on a mass-production basis, it is good practice to provide a rectifier gallery adjacent to the plating line

and glue. In one method, the abrasive is sprinkled onto a belt that has previously been brushed with hot glue. Another method requires making a thick paste of hot glue and abrasive and spreading it on the belt with a brush, knife or trowel. Factory-coated abrasive belts are preferred because of the uniformity of abrasive coating. Polishing belts are run at 4500 to 6000 sfpm.

Scratch Brushing

Most scratch brushing is now done with a greaseless composition on a cotton cloth wheel. Chief advantage of this method is that it eliminates both a buffing and a cleaning operation that were necessary after the use of grease-bound, scratch-brush compositions. Before being scratch-brushed, the work should be clean (often "bright dipped" in acid). Various finenesses of scratch are obtained by means of sharp or mild abrasives of different grain sizes and by variation in the packing of the wheel and its speed. The wheel packing will be discussed under "Buffing." Some scratch brushing on surfaces is done with a wire or tampico wheel, wet or dry, with a little soapy water and 0½ pumice.

Wheel Buffing

The highest luster on copper alloys is produced by wheel buffing.

Equipment — Either a buffing lathe of variable speed or lathes run at different speeds, 1200 to 3600 rpm. Buffing wheels may be incorporated in semi-automatic or fully automatic machines.

Materials — Cotton cloth (rag) wheels; different finenesses of tripoli composition; lime composition; and red rouge (iron oxide). Abrasives are in bar form, and are bound with a grease mixture that contains a considerable amount of double-pressed stearic acid.

Procedure

1. Usually started with at least 12-in. sections of cotton buffs.
2. Rake the revolving wheel with a strong stick through which nails protrude about 1 in. apart.
3. Apply selected buffing composition to the wheel as needed.
4. Buff work by holding it up to the face of the wheel. After buffing, withdraw the part in the direction of wheel rotation, which is downward. Small workpieces are often held in a revolving chuck.

Remarks — To soften a wheel, "spacers" are used in packing. Spacers are worn-down buff sections placed between full-size sections. The larger the percentage of spacers, the softer the wheel. Judicious use of spacers often permits "cutting down" and "coloring" on the same spindle, by packing one side of the wheel hard and the other side soft. For cutting down, a tripoli composition is used on the rag wheel, while for coloring, a white lime or red oxide rouge (iron oxide) is generally used. The cutting-down operation removes polishing lines and light metal imperfections; the coloring operation develops the ultimate luster.

Operations should be adequately ventilated to protect the operator from dust.

Buffing is a relatively expensive operation, but often costs can be reduced considerably by close cooperation among the designing, buffing and processing departments. The metal should have the minimum grain size consistent with the working operations in order to buff smooth.

Belt Buffing

For some intricate shapes, such as the inside surfaces of an S-bend trap, a woven cotton belt driven at 6000 ft. per min. may be used advantageously. The tripoli or other composition is applied to the belt.

Sandblasting

Sandblasting with sand, steel grit or shot is done at air pressures of 25 to 100 psi. The objective may be to produce a dull, rough finish for appearance; to prepare a surface that affords excellent adhesion to enamels and other decorative coatings; or to create designs on the surface.

Chemical and Electrochemical Cleaning

In the course of processing and fabricating, copper alloys may become coated with lubricating oils, drawing compounds, greases, oxides, dirt, metallic particles or abrasives, which must be removed by cleaning. The type of cleaning employed will depend on the type of lubricant and other materials to be removed, the equipment available and the degree of cleanliness required. The nature and size of the pieces also influence the selection of the equipment or process to be employed.

Mechanical scrubbing, accomplished by turbulent boiling, pressure spraying, or agitating, where permissible, helps in the removal of any substances not too adherent, and thus aids in cleaning. Occasionally, hand brushing may be used, but production requires mechanical methods.

Lubricants made from animal or vegetable oils or greases, such as tallow, lard oil, palm oil and olive oil, can usually be removed by saponification, which is accomplished by immersing the parts in an alkaline solution.

Mineral oils such as kerosene, machine oil, cylinder oil and general lubricating oils, are usually removed from the metal by an emulsification process. Soap is the wetting agent and dispersing medium.

Dirt particles, abrasives, metal dust and inert materials are generally removed by one or both of these processes.

Solvent Cleaning

The greater portion of oils is removed from coated pieces by immersing them in a solvent, such as Stoddard's solvent, which is a low-boiling fraction of mineral oil, with a minimum flash point of 100 F. and no lasting odor. Centrifuging, after the last immersion, removes excess solvent; the pieces are then virtually free from oil. Solvent cleaning is often used for screw-machine work.

Degreasing

Degreasing, or vapor cleaning, (generally with inhibited trichlorethylene) is used when oil must be removed quickly. For cleaning, the metal part is placed in a container where solvent vapors can condense on it. Condensate washes away the oily coating and leaves the piece clean and dry. Degreasing machines with two or three compartments are preferred.

Alkaline Scouring

Alkaline cleaning baths (hot) are used primarily for removal of oils, greases, solid particles of dirt and metal particles. The chemicals saponify, or make soap of, vegetable and animal oils and fats, and emulsify mineral oils and greases, suspending the solid materials. Either the dirt is removed from the metal surfaces, or its tendency to cling is greatly reduced. The essentials here are a combination of a sufficient quantity of active chemicals and agitation when possible. Soap is used as a direct addition to the cleaning bath, or is formed by saponification of vegetable or animal fats and oils present.

The following are satisfactory cleaning formulas:

FORMULA 1

85% sodium orthosilicate
10% sodium carbonate
5% sodium resinate

FORMULA 2

46% sodium carbonate (anhydrous)
32% trisodium phosphate
16% sodium hydroxide
6% rosin

Caustic soda and soda ash are the cheapest and most direct means of producing alkalinity in the bath. However, as a general rule such materials possess less surface activity than materials of more complex chemical structure. Sodium metasilicate, trisodium phosphate and similar salts, with the addition of suitable wetting agents, are often used to obtain alkalinity in a solution.

To be effective, the alkaline cleaners should exhibit the following characteristics:

1. They should wet the surface of the material.
2. They should penetrate the layers of dirt.
3. They should have good emulsification and deflocculation or suspending properties.
4 They should be "free rinsing."
5. They should saponify animal and vegetable oils.
6. They should have the ability to remove mineral oils by the mechanism of wetting, emulsification and deflocculation.

To accomplish the above objectives, the essential requirements for a good alkaline cleaner are that it should be a source of available alkali, should have a buffer to control alkalinity, should be readily soluble, operate at optimum cleaning temperature, be stable, and have good detergent ability and rinsing qualities. Various temperatures and concentrations are permissible. The range of temperature may be from 120 to 200 F. and the concentration from 3 to 8 oz. per gal., depending on the requirements of cleaning. These characteristics are listed to indicate the need for using a type of cleaner that is compounded for a specific purpose.

For alkaline cleaning, where work can be put into baskets or on racks and raised from and lowered into a solution, steel tanks are the simplest and least expensive to install. The more highly mechanized units consist of belt conveyers where work material passes over and under sprays; and also of spiral drum cleaning units, where alkaline cleaner is scooped up and thrown over the pieces.

Emulsion Scrubbing

For emulsion scrubbing, a number of proprietary preparations are used. They consist of an emulsifying agent that acts to disperse

organic solvents in water solutions. These emulsifiable cleaners, miscible with oil, can be washed off with water, although a slight film of oil may remain on the work, necessitating a subsequent alkaline cleaning. Drag-out costs are fairly high. Parts carrying oils or other substances to be removed are immersed in this type of cleaner. The cleaning agents penetrate and unite with the oils and dirt on the surfaces of the articles, and during subsequent immersion in water solution, both the emulsion cleaner and the oil and dirt that it has wet are washed away. Steel tanks are usually suitable for holding these materials.

Electrolytic Cleaning

Alkaline solutions are used in electrolytic cleaning, which is performed before plating. Workpieces are usually placed on racks. The tanks are equipped with bus bars, and these in turn are connected to a generator. When work is put on a cathode bar, the procedure is termed "direct cleaning;" when on an anode bar, "reverse cleaning." The bath is maintained as near the boiling point as permissible without excessive tarnishing. The gas evolved, because of the work being made an electrode, tends to lift off the soil, providing a clean surface for subsequent operations.

The usual procedure in electrocleaning is to make the work the cathode. The purpose of this is to obtain as high an evolution of gas as possible, although in some present processes only anodic treatment is employed. The merits of one, as against another, depend on what, specifically, is to be accomplished, and the nature and type of work and chemicals employed. Many formulas are available for electrocleaning but the one used will depend on the material to be cleaned and the amount of tarnish permissible. Electrolytic cleaning is often as satisfactory as hand scrubbing. It also makes possible the cleaning of many parts for which hand scrubbing would be impracticable or too costly.

Removal of Tarnish

Brass and copper articles often become discolored or tarnished while standing, or during the course of alkaline cleaning. The tarnish can be removed when the work material is free from oil or grease, by immersing the parts in a water solution containing 4 to 8 oz. of sodium cyanide per gal. After discoloration has been removed (usually a matter of seconds), the pieces should be rinsed thoroughly. Steel tanks are suitable for holding the solution.

When parts are cleaned in alkali, the alkail should be completely removed, because if alkali and cyanide are mixed and allowed to stand, ammonia may be developed. Care must be taken not to allow cyanide to come in contact with acid, because of liberation of lethal hydrocyanic acid gas.

Tarnish can also be removed in dilute hydrochloric acid or in dilute sulfuric acid, usually 5 to 10% by volume, followed by rinsing.

Summary

When the practical application of cleaning cycles is considered, the kind of equipment available or required for performing a process will determine what type of cleaning should be, or can be, employed. The nature and size of the pieces to be cleaned also determine the kind of equipment or process to be employed. Very small pieces are handled in baskets or in bulk. Large, highly polished pieces are handled individually or are placed on racks where there is no chance for one piece to come in contact with another. Oils or other materials should be removed without darkening the metal, since further treatment may be required to restore the original color and luster.

In planning the production of a new article, consider the kind of lubricants to be used in manufacturing and processing operations, with particular reference to the ease of removing these substances later with the cleaning equipment available.

Pickling and Bright Dipping

When copper and copper alloys are annealed in an oxidizing atmosphere, they are discolored by formation of surface oxides, which can be removed by pickling. This treatment leaves the surface without a bright color. A treatment that gives an absolutely clean, bright, lustrous surface is termed "bright dipping" and is always preceded by a pickling operation.

A pickling or bright-dipping solution depends on the action of suitable acids (usually nitric or sulfuric) to dissolve the oxides by chemical reaction. In certain instances, oxidizing agents are added to convert lower oxides, which may be insoluble in the acid, to higher oxides that can be dissolved readily.

Pickling of Copper and Copper Alloys

These materials include the tin bronzes, phosphor bronzes, manganese bronzes, naval brasses and aluminum brasses. These alloys, with scale consisting largely of cupric oxide, cuprous oxide and zinc oxide, are generally pickled in dilute sulfuric acid of the following composition: concentrated sulfuric acid (H_2SO_4, sp. gr. 1.83), 5 to 10% by volume; the rest, water.

This solution is used from room temperature to between 125 and 150 F. Strength and temperature of the solution, as well as the duration of immersion, vary with the alloy being cleaned and the amount of oxides present. A small amount (less than 1%) of copper sulfate may be added to the fresh solution to increase the initial speed of reaction.

Cuprous oxide (sometimes called "red oxide") is only slightly soluble in sulfuric acid. Consequently, after pickling in dilute sulfuric acid, brasses may have red stains. A stain of similar appearance may also result from a film of copper deposited galvanically, or from localized superficial dezincification. These stains may be eliminated by immersion of the metal in the following solution:

Concentrated sulfuric acid (H_2SO_4, sp. gr. 1.83), 4 to 10% by volume

Sodium bichromate ($Na_2Cr_2O_7$ commercial) 4 to 8 oz. per gal. of solution

Water, remainder.

This solution is operated at temperatures from 80 to 120 F. The articles should first be pickled in sulfuric acid and then immersed in the bichromate solution to remove red stains. Duration of immersion is determined best by trial; too brief an immersion leaves stains and too long a dip etches the metal.

Commercial ferric sulfate may be used instead of sodium bichromate. About 10 to 25 oz. per gal. of ferric sulfate is used in a solution containing 4 to 10% by volume of sulfuric acid at temperatures up to 150 F. The ferric sulfate should be dissolved completely before being used. It has been found that this solution has less tendency than bichromate to etch the metal, although the finish and color are not exactly the same as obtained with the bichromate solution.

Great care should be taken to rinse the metal thoroughly after treating with the above solutions. General several water washes, both hot and cold, are used, and sometimes a hot solution of 1 to 2 oz. per gal. of soap, which neutralizes any residual acid remaining on the metal. The parts should then be dried completely in hot air, sawdust or by other means to avoid water stain.

Bright and Matte Dipping

When a bright lustrous finish is desired, the metal should first be pickled in the sulfuric acid pickle, and then given a "scale" dip, and finally a bright dip. The pickling removes oxides and the scale dip prepares the surface for the bright dip that follows. Scale dips and bright dips consist of sulfuric and nitric acids, in proportions that vary greatly from plant to plant. In general, nitric acid will speed up the action of the dip, and sulfuric acid will slow it down. The following dips are typical:

SCALE DIP

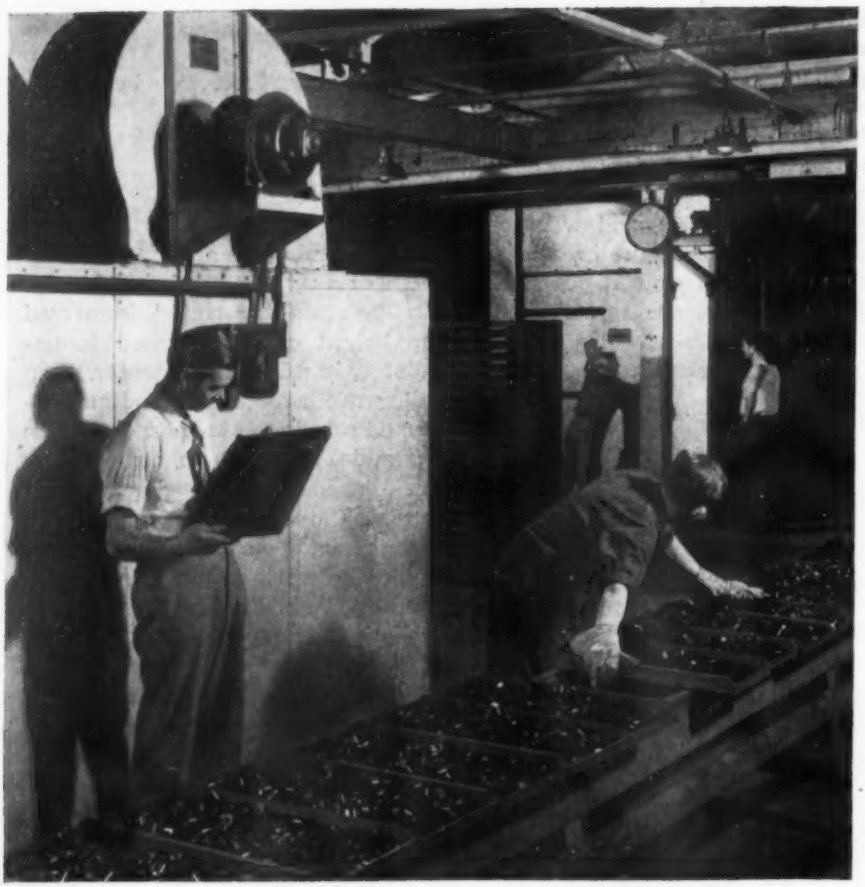
	A	B
Concentrated nitric acid (HNO_3 sp. gr. 1.40) by volume	40%	50%
Concentrated sulfuric acid (H_2SO_4, sp. gr. 1.83) by volume	30%	....
Concentrated hydrochloric acid (HCl, sp. gr. 1.16)	0.5%	....
Water	29.5%	50%

BRIGHT DIP

Concentrated nitric acid .....25% by volume
Concentrated sulfuric acid .....60% by volume
Concentrated hydrochloric acid ....0.2% by volume
Water .....Remainder

These solutions are used at room temperature. Parts are immersed in the scale dip, rinsed, immersed in bright dip and rinsed immediately in cold running water. Then they are rinsed in a sodium cyanide solution (2 to 4 oz. of sodium cyanide per gal.) to remove any acid stains, are rinsed again and dried. Care must be taken to clean off the acid completely before dipping the work material in the cyanide; otherwise, deadly hydrocyanic acid gas may form.

INSPECTION in clean, well-lighted surroundings pays dividends in maintaining quality of mass-produced articles. Racking is one of the convenient methods of handling small work in process



JAPANNING of small parts is frequently done in batch-type ovens. Trays of dipped parts are loaded into a tier truck and run into the oven for stated interval, then removed to an inspection line

In some plants, it is customary to add wood soot to the bright dip to insure uniformity of brightness on the surface of dipped articles. The soot is stirred in and then skimmed off, a procedure that is said to overcome the effect of too much hydrochloric acid, which results in irregular brightness.

A matte surface can be obtained after bright dipping, rinsing and drying, by using the following typical solution, which should be agitated occasionally:

Concentrated nitric acid .....65% by volume
Concentrated sulfuric acid .....35% by volume
Zinc sulfate ($ZnSO_4$, commercial)..1 lb. per gal. of solution

This dip is used at 180 F. The parts are dipped, rinsed and dried in the usual manner.

All the above solutions should be provided with an adequate ventilating system.

Pickling of Aluminum Bronzes

Aluminum bronzes are very difficult to pickle and dip because of the presence of aluminum oxide. It is recommended that they be annealed in a non-oxidizing atmosphere. Alloys that contain up to 7% Al are pickled in a sulfuric-acid solution, such as that used for brass. This treatment leaves the metal clean but dull, because aluminum oxide is not soluble in sulfuric acid. A solution containing approximately 3% by volume af sulfuric acid and 3 to 4 oz. per gal. of sodium bichromate, may be used. A bright finish is obtained only by mechanical cleaning, and alloys with more than 7% Al must have a mechanical treatment to remove any oxides.

Pickling and Bright Dipping of Silicon Bronzes

Because of the refractory nature of silicon oxide and the solubility of it in any acid except hydrofluoric, it is advisable to anneal silicon bronzes in a protective atmosphere. If the metal has been subjected to an oxidizing atmosphere, a sulfuris acid pickle (5 to 10% by volume) is sometimes used in order to remove copper oxide from the metal, although the silicon oxide is unattacked and the metal is left with a dull finish. Where a clean bright surface is required, the following dip is used after a sulfuric acid pickle:

Concentrated sulfuric acid ..... 5% to 10% by volume
Concentrated nitric acid .....10% to 20% by volume
Commerical hydrofluoric acid (HF, 52%)..3% to 5% by volume
Water .....Remainder

Great care should be taken when using this dip. Metal or ceramic tanks are not suitable. A wax or carbon-base lining material must be used and the tank should be provided with a hood and an exhaust to remove dangerous acid fumes. The dip should be employed at room temperature, and parts should be rinsed carefully after they have been removed from the solution. This solution is extremely powerful and workmen should be protected carefully from any contact with fumes or liquid.

Pickling and Bright Dipping of Nickel Silvers and Cupro-Nickels

The nickel silvers may be pickled and bright dipped with the same solutions as brass and copper.

Cupro-nickels may be pickled in a bichromate bath of the kind used for brass, or in a ferric sulfate bath that contains up to 25% ferric sulfate in a 5 to 10% sulfuric acid solution at temperatures up to 150 F. Cupro-nickels may be bright dipped in the usual solution employed for brass.

Defects from Pickling

By far the most common defect encountered in pickling is the presence of red stain on the metal. When caused by cuprous oxide, this defect may be removed in a bichromate or ferric sulfate pickle. However, red stains may also re-

sult from the presence of metallic iron or steel in the pickling solution, causing copper to plate out on the parts because iron is anodic to copper. Great care must be taken to prevent any stray pieces of iron, such as nails or tools, from entering the pickling solution.

Oil and lubricants remaining on formed metal are a source of much trouble in pickling and dipping. If formed material is to be bright dipped directly after having been pressed, it should be degreased, because otherwise the lubricant remaining will prevent the dip from being effective. Also, if the work is to be annealed and pickled, it should be degreased (usually a hot water rinse is sufficient) since the oil may cause excess cuprous oxide to form during annealing, with unwanted red staining as a result. In extreme instances, the more volatile constituents of the oil burn off readily, leaving a carboniferous deposit that cannot be removed except mechanically.

Acid stains will appear on the metal if it is not thoroughly rinsed and cleansed of all remaining acid after pickling or dipping. At least two separate washings in water or one thorough running-water wash should be used before drying. A dip in a soap solution or buffered salt solution will neutralize traces of acid.

The metal will be etched or pitted if it is immersed too long in a pickling solution or dip, or if the solution is too strong or too hot. The proper conditions for operation may be found quickly by a trial of time, temperature and concentration of solution.

GOLD PLATING, must be a precision operation. A short immersion is all that is required for the usual product so decorated. Good control equipment is essential when plating with precious metals

Surface Preservation and Decoration

Immediately before final assembly of small manufactured articles, the surface finish is often protected by application of clear transparent lacquer or is decorated by colored enamel. The coating should be adhesive, tough, highly resistant to abrasion and perspiration, and relatively impervious to sulfur fumes.

An operator should wear soft cotton gloves when handling the material after cleaning and before lacquering. Enamels or lacquers should not be applied to metals that are even a little dirty. Work pieces should be lacquered promptly after cleaning.

Application of Lacquers or Enamels

Hand Brushing—A soft, firm bristle or camel's-hair brush is used, and the finish should be flowed on with little or no rebrushing.

Hand Spraying—The material is finely atomized in a spray gun by means of compressed air. Striping can be effected with a small spray gun; the other extreme is a fan spray of 15 in. A good smooth coat requires an experienced sprayer. A single coat may be from 0.0002 to 0.002 in. thick.

Automatic Machine Spraying—This method is suited to large-volume production.

Dipping by Machine—The work material is mechanically withdrawn, slowly and uniformly, with little or no vibration, from the clear cellulose or synthetic lacquer. This method produces a uniform film, except on edges, and is economical of material. Sometimes this process is limited by the shape of the product.

Basket Bulk Dipping—The work is placed in screen baskets, is immersed in clear lacquer and withdrawn; the excess is allowed to drain while the baskets are revolving slowly in an oblique frame. Then the workpieces are dried in an oven, where they are rotated manually or mechanically to prevent sticking together. This can be the least costly lacquering procedure when protection until use is all that is required. Parts that nest together, or flat pieces, are not adaptable to bulk lacquering.

Centrifuging — The work in screen baskets is immersed in clear lacquer and withdrawn, the excess lacquer is allowed to drain, and then the basket is placed in a cen-

SPRAYING of highly finished work is best carried out in an air-conditioned room, in order to avoid lint and dust from settling on the finish and causing its subsequent rejection

trifuge and whirled for 30 sec. in one direction, and 30 sec. in the opposite direction. The pieces are transferred to an oven and dried, after shaking once or twice to prevent sticking.

Barrel Tumbling—Small, lightweight pieces that cannot nest are placed in a oblique, wide-mouth barrel (made of brass, stainless steel or Monel metal) revolving at about 30 rpm. A small quantity of lacquer (for instance, 2 oz.) is applied to the inside of the barrel, whence it is transferred to about 25 lb. of work, coating only the outside of shells that have a cup shape. The parts are dried in an oven, with periodic agitation, and then baked to polymerize the film. One coat is not sufficient to give a continuous film, so barrel tumbling is used only with baking finishes that enable the application of several coats.

To maintain uniform coatings, check lacquers or enamels with an orifice-type viscosity cup.

Characteristics of the seven methods of application are summarized in Table I.

Enamels

Enamels are essentially clear lacquers, air-drying or baking, in which pigments and plasticizers have been incorporated. They may have a high luster or a dull finish.

With the use of stencils to blank off areas, enamels of air-drying or baking types are often employed to decorate a brass article with attractive designs. The air-drying types are always soluble in the solvents in which they were originally mixed; after baking, the baking types are not soluble in their original solvents, since baking polymerizes the coating to an insoluble condition. Ingenious mechanical devices have been constructed to apply enamels in patterns, by roller coating, screen stenciling and printing.

Some products are made with depressed designs in the metal, so that after clear lacquering or enameling, these designs can be filled in with colors.

For most articles, more than one type of lacquer or enamel will be satisfactory. If equipment for baking is available, a baked finish can be the least expensive because of reduction in the number of coats necessary to obtain the same thickness of film. Baking enamels may be sprayed with a solids content of 50%; whereas a solids content of 25% is high for air-drying nitrocellulose lacquer enamel.

In coating of copper alloys, it is not necessary that the first enamel coat contain a passivating pigment in order to prevent rusting. Sometimes it is desirable to use for the first coat an enamel and lacquer with especially good adhering qualities, and in special instances it is desirable to roughen the surface by sandblasting or by dipping in acid to attain superior adhesion. Tables II and III list factors relating to the lacquer finishes that are used most extensively at present.

All solvents used in lacquers and enamels are toxic to some extent if breathed in regularly. Therefore, positive ventilation by suction should be provided to protect the operator. All solvents have two fundamental properties that should govern any design for ventilation: (a) When cold, every solvent is heavier than air and naturally flows downward. (b) When solvents are hot, convection currents more than offset gravity, so hot solvents rise.

Rubbing-type paste wax, used over lacquer or enamel, will increase the durability of the finish. This is particularly true of objects used outdoors, but is likewise true of articles that are subject to much handling. A wax coating is easily renewed.

Cleaning and Electroplating

The process of cleaning fabricated parts made of copper and copper alloys, in preparation for electroplating and lacquering, is comparatively simple. Fewer difficulties are encountered than with various other metals and alloys. Adequate cleaning is very important. Metals such as gold, silver, nickel and chromium are electrodeposited on copper and copper alloys primarily for decorative purposes and for preventing tarnish. A light deposit will give satisfactory protection.

Coloring and Chemical Dipping

Immersion Plating Of Copper and Copper Alloys

All articles must be thoroughly cleaned and bright dipped before being treated in the following solutions in order to obtain the desired coatings. A short immersion is all that is required in either the gold or the silver solution. After removal from any of the following baths, articles should be rinsed in cold water, then in hot water, and dried.

SILVER

Silver nitrate.....1.25 oz. per gal.
Sodium cyanide .....2 oz. per gal.

Use a stoneware or agateware receptacle. Temperature should be approximately 110 F.

GOLD

Sodium gold cyanide..0.5 oz. per gal.
Sodium cyanide.....2.5 oz. per gal.
Sodium carbonate ....2 oz. per gal.

Use a stoneware or agateware receptacle. Temperature should be approximately 180 F.

TIN

Stannous chloride.....4 oz. per gal.
Caustic soda .....8 oz. per gal.

Use a steel tank and operate the bath at approximately 195 F. The fabricated articles must be spread out on steel mesh and covered with strips or sheets of perforated tin for about 2 hr.

Coloring of Copper or Copper Alloys Containing 85% Cu or More

Yellow brass articles are often copper-plated and treated as copper in the following solutions:

Reddish Bronze to Dark Brown (Statuary Bronze)

Either of the following solutions may be used:

SOLUTION A

"Liquid Sulfur"..... 1 oz.
Potassium sulfuret (liver of sulfur) .....2 oz.
Aqua ammonia (sp. gr. 0.89)..¼ oz.
Water .....1 gal.
Use solution at room temperature.

SOLUTION B

Potassium sulfuret (liver of sulfur) ..... 2 oz.
Caustic soda ..... 3 oz.
Water ..... 1 gal.
Use solution at approximately 170 F.

The depth of the shade can be controlled by the strength of the solution and duration of immersion. After the articles have been removed from the bath, they should be rinsed thoroughly in cold water, then in hot water, and dried either in hot sawdust or with an air blast. The desired finish is obtained by dry scratch-brushing on a fine wire wheel, and lacquering.

Table I
CHARACTERISTICS OF METHODS OF APPLICATION FOR LACQUERS OR ENAMELS

METHOD	OPTIMUM APPEARANCE OF FINISH	OPTIMUM DURABILITY OF FINISH	MATERIAL CONSUMPTION	RELATIVE LABOR COST
Hand brushing	Fair	Fair	Low	High
Hand spraying	Excellent	Excellent	High	High
Automatic machine spraying	Excellent	Excellent	Very high[a]	Very low
Machine dipping	Excellent	Excellent	Low	Low
Basket bulk dipping	Fair	Fair	Low	Very low
Centrifuging	Good	Good	Low	Very low
Barrel tumbling	Good	Excellent	Low	Low

(a) May be reduced by the use of electrostatic equipment.
Note: Containers may be made of 18% nickel silver, chromium-plated or silver-plated brass or ceramic

Table II
AIR-DRYING LACQUERS AND ENAMELS (Thermoplastic)

CHIEF INGREDIENTS	OUTSTANDING GOOD CHARACTERISTICS	IMPORTANT LIMITATIONS
Nitrocellulose-resin	Compatibility with resins and solvents; nearly colorless, cheap, quick drying	Temperature, 180 F.
Cellulose-acetate-resin	Better resistance to heat and light than nitrocellulose	Few solvents available, few resins compatible
Cellulose acetate-butyrate resin	Outdoor durability	Few resins compatible, cost high
Ethyl-cellulose resin	Good resistance to alkalies	Ready solubility in many solvents
Polyvinyl resin	Resistance to acids and alkalies	Ready solubility in ketones and chlorinated solvents
Natural resins (as shellac)	Excellent adhesion	Easily scratched
Methacrylates	Clarity	High cost

Notes: The nitrocellulose resin mixtures are the most widely used. "Blushing" is a term applied to whitening caused in the lacquer film when moisture condenses in the wet coating. This is a result of the cooling effect from the rapid evaporation of the solvents in an atmosphere of high humidity. Blushing may be corrected by the addition of up to 10% of solvents that evaporate slowly. Air-conditioned rooms eliminate this atmospheric problem.

Table III:
BAKING LACQUERS AND ENAMELS (Thermosetting)

CHIEF INGREDIENTS	OUTSTANDING GOOD CHARACTERISTICS	IMPORTANT LIMITATIONS
Urea-formaldehyde	Hard, colorless; resistant to chemicals	Temperature, 300 F.
Melamine	Colorless, resistant to alkalies and high temp.	High cost
Alkyds (glycerol-phthallic acid)	Outdoor durability, excellent adhesion	Slightly yellow; not so hard as urea-formaldehyde
Phenol-formaldehyde	Resistant to chemicals	Darkens in light
Polyvinyl resin	Highly resistant to acids and alkalies	High cost

Notes: The urea-formaldehyde, alkyds and phenol-formaldehyde mixtures are the most extensively used. The different kinds are often combined in order to obtain the required characteristics in the finished product. The baking schedules are for 5 to 60 min. at temperatures from 250 to 350 F.

Steel Black

Arsenious Oxide (white arsenic) ..... 4 oz.
Hydrochloric acid (sp. gr. 1.16) ..... 8 fluid oz
Water ..... 1 gal.

Use solution at approximately 180 F. Immerse the articles in the above solution until a uniform color is obtained. Scratch-brush while wet, then dry and lacquer.

Black

Several proprietary processes are available for producing a satisfactory black finish on copper and copper alloys.

Coloring of Brass

All articles should be cleaned thoroughly and bright dipped before they are placed in the following solutions:

Black

Place a suitable quantity of brass articles in an oblique tumbling barrel made of stainless steel, and cover them with warm water; usually 3 to 5 gal. is sufficient. Dissolve 3 oz. of copper sulfate and 6 oz. of sodium thiosulfate in warm water in a separate container, and add to the contents of the barrel. Tumble the articles for 15 to 30 min. to obtain the desired black finish. Drain the solution from the barrel and wash the articles thoroughly with clean water. Remove articles from the barrel, dry them in sawdust or with an air blast, and lacquer them if desired.

Blue Black

Copper carbonate ..... 1 lb.
Ammonium hydroxide (sp. gr. 0.89) ..... 1 qt.
Water ..... 3 qt.

Mix the copper carbonate thoroughly with the ammonium hydroxide, and then add the water. This solution should be used at approximately 175 F. It is desirable to have an excess of copper carbonate present. Immerse the workpieces until the proper color is obtained, which should be in about one minute. Remove the pieces, rinse them in warm water, and immerse in a hot cleaning solution made by adding 2 to 4 oz. of alkaline cleaner per gal. of water. Rinse the articles thoroughly, first in cold water, then in hot water, dry, and lacquer.

Black Anodizing*

Caustic Soda ..... 16 oz.
Water ..... 1 gal.

Use the solution in a steel tank, and operate at 180 to 210 F. with adequate ventilation. Cathodes may be steel, carbon or graphite, and the brass articles serve as anodes. Anode to cathode ratio, approximately 1:1. Current density, 2 to 10 amp. per sq. ft. at 6 v. Plating cycle, 45 to 225 sec. After the articles have been anodized, wash then in hot and cold water, then rinse them in clean hot water. Dry, buff lightly with a soft cloth wheel, and lacquer if desired.

* McLean and Young, *"Metal Finishing,"* June 1945.

Brown

SOLUTION A

Copper sulfate ..... 4 oz.
Potassium chlorate ..... 8 oz.
Water ..... 1 gal.

SOLUTION B

"Liquid Sulfur" ..... 1 oz.
or
Liver of sulfur ..... 2 oz.
Water ..... 1 gal.

First immerse the articles in Solution A for approximately one minute. Then without rinsing, immerse in Solution B for a short time. The article should then be rinsed in cold water, and the dipping operation should be repeated in both solutions until the desired color is obtained. Finally, rinse the work in hot water, dry in hot sawdust or with an air blast, scratch-brush with a fine wire wheel and lacquer.

Old English Finish (Light Brown)

SOLUTION A

"Liquid sulfur" ..... ½ oz.
or
Liver of sulfur ..... 1 oz.
Water ..... 1 gal.

SOLUTION B

Copper sulfate ..... 2 oz.
Water ..... 1 gal.

Immerse the articles in Solution A and, without rinsing them, immerse in Solution B. Then rinse them in cold water, and repeat the dipping operations until a light color is produced. For a uniform finish, scratch brush and then repeat the dipping operations, first in Solution A and then Sclution B, until the desired color is obtained. Finally, rinse the pieces thoroughly in cold and hot water, dry them in sawdust, scratch brush on a fine wire wheel and lacquer. A great variety of colors can be imparted by electrocoloring.

1949 — Can Be a Good Year Too

You can expect good business to run on well through 1948.

But old-time competition is close upon us.

And 1949 will be a critical year for all of us — making lower taxation imperative NOW.

These are the main conclusions drawn from a nation-wide survey of industry's plans for new plants and equipment which McGraw-Hill has just completed. Here are the major findings:

1. Capital expenditures in 1948 may be a little lower — but at the most only 8% lower — than in 1947.
2. In 1949 capital expenditures may decline. 1949 plans are still fluid. However, those which have been projected now show a falling off. (Washington planners, please note: Current official attempts to discourage capital expansion may turn out to be superfluous — or downright dangerous.)
3. Industry's initial postwar rebuilding will be 85% complete at the end of 1948. When this first wave of deferred maintenance and expansion is finished, American industry will have more than half again the capacity it had in 1939. This does not mean the end of needed capital expenditures. Business will need to invest much more. (President Truman sets an investment goal immediately ahead of $50 billion.) But it does mean that tough competition is returning fast.

• IF YOU WANT *full details of the McGraw-Hill survey of Capital Expenditures, which is summarized in this editorial, write to the Economics Department, McGraw-Hill Publishing Company, 330 West 42nd Street, New York 18, N.Y.*

These are solid facts, based on plans which are firmly made by a broad cross-section of American industry and which the McGraw-Hill survey revealed.

The greatest contribution of this survey is the information it supplies on business plans for the purchase of new plants and equipment. What business planned to do about such expenditures was by far the biggest unknown element in the 1948 outlook. For, if business planned to slash its outlays for plants and equipment this year, that fact alone could bring a sharp downturn in business.

In making this survey, McGraw-Hill researchers all over the nation personally interviewed top executives of companies selected to make up a scientific cross-section of industry. Each executive was asked to give, *not his opinion* about general business trends, but *factual details* about his company's plans for 1948. By adding together the plans of the companies interviewed, McGraw-Hill has secured, for the first time, a reliable picture of what business plans to do in the months ahead.

Here are plans for 1948 and 1949, as revealed by the survey:

1. Industry still needs more than a year to finish its initial postwar maintenance and rehabilitation program.

Among manufacturing industries, top executives report that 64% of their program for the immediate postwar period is now complete. According to present plans, 85% will be installed by the end of this year even though some manufacturing industries still have a long way to go. For instance, oil companies will complete only three-quarters of their presently planned expansion program by the end of 1948.

2. Business may spend less on new plants and equipment this year than the record $16.1 billion spent last year. But the decline

probably will be negligible and certainly will not be great enough to bring on a business recession.

At the time McGraw-Hill interviewed top executives, some companies had not yet approved their 1948 capital budgets. Under the extreme assumption that those particular companies will make *no* capital expenditures in 1948, industry's 1948 bill for new plants and equipment will run to $14.9 billion, or 8% below last year's record figure. Under the more realistic assumption that those companies will cut their capital investment only as much as the companies which had already drawn up their plans for 1948, industry's 1948 capital budget will run to almost $15.8 billion, a decline of only $300 million from 1947.

Thus the over-all conclusion of the McGraw-Hill survey is that capital expenditures by business will be only slightly lower this year than last.

3. Business executives will not slash their 1948 capital budgets unless they are convinced that a real slump is in the offing—and they are not convinced now.

Almost two-thirds of all manufacturing companies say they would not cut capital budgets sharply even if business activity declined 20%. What is more, even a 15-20% boost in wage rates would have little effect on projected capital budgets. If wages go up, 57% of manufacturing companies would not change their capital budgets, 26% would increase them, and 17% would cut them.

4. Most executives look for an increase in their company's sales this year.

More than half of all manufacturing companies are planning on a sales increase over last year of 10% or more. A third of them say sales will be about the same as in 1947. And fewer than 10% look for lower sales.

5. Manufacturing companies will finance much of their purchases of new plants and equipment in 1948 from funds set aside out of past or current earnings.

Utilities and railroads, on the other hand, must go to the securities markets or commercial banks to finance most capital expenditures.

Although manufacturing companies say they can finance this year's capital expenditures in large part from current profits and past savings, all evidence indicates that, to do so, they will use up most of the funds they earmarked during the war for this purpose. So in 1949, industry must go to the capital markets or to the commercial banks if it is to continue to spend for capital purposes. If the securities markets continue to lie in the doldrums, *as they will under present tax laws,* only companies with triple A credit ratings will be able to raise funds that way.

6. Purchases of new plants and equipment may fall off in 1949.

The McGraw-Hill survey collected all available evidence on plans for 1949 capital budgets. Fewer than 40% of all manufacturing companies now have definite plans for 1949. Of those that have plans, 45% intend to spend less than in 1948, 30% plan to spend the same amount, and a quarter expect to spend more. These preliminary decisions would seem to indicate that capital investment may fall off in 1949.

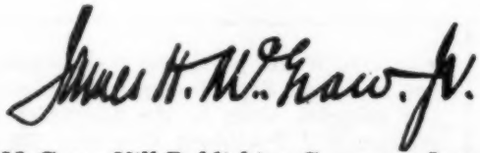
7. Industry's production capacity in 1949 will be far above prewar.

Manufacturing capacity will be more than 50% greater than in 1939 once the present wave of postwar building is complete. Almost a third of all manufacturing companies report that their capacity will be double or more than double the prewar figure. Thus, 1949 may see a huge increase in production of many things that now are hard to buy.

The last two points in this summary mean that 1949 will be a critical year. We must forestall a sudden drying up of capital expenditures in that year. We must be able also to absorb a great outpouring of production both of capital and consumer goods.

What will happen to business in 1949, therefore, will depend on how successful we are this year in dealing with such momentous problems as taxation, foreign aid and prices. But 1949 *can* be a good year too.

The next editorial in this series will discuss the pivotal problem of taxes.

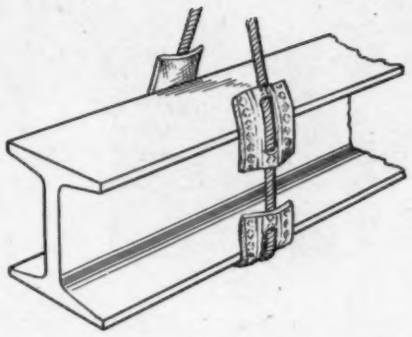


President, McGraw-Hill Publishing Company, Inc.

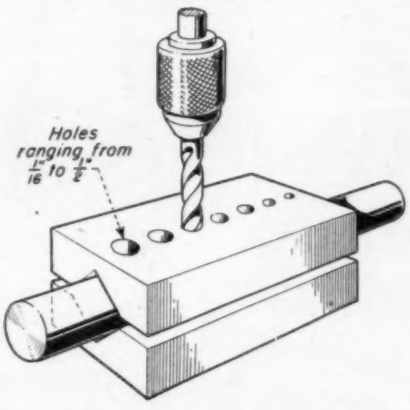
THIS IS THE 65TH OF A SERIES

Short Cuts FOR THE SMALL SHOP

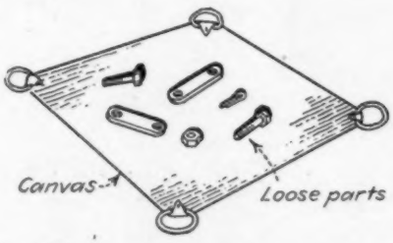
BY A. H. WAYCHOFF



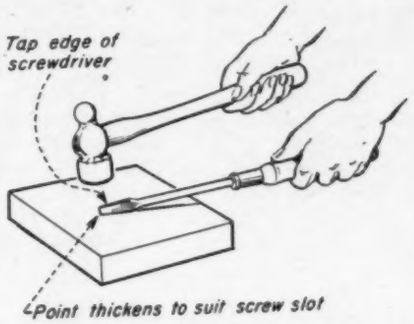
SECTIONS OF tire carcass make good protectors for sling ropes. Cut holes near the bead and thread the rope through as shown. The rubber cushions the rope against sharp edges on pieces being lifted.



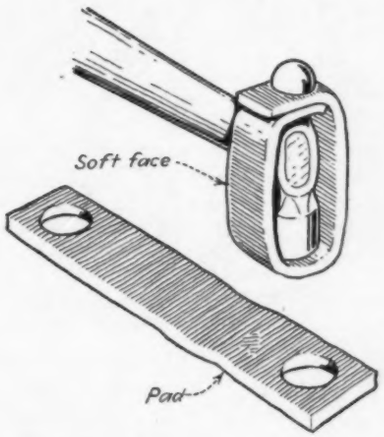
DRILL GUIDE HOLES make V-blocks more useful, especially when drilling cross holes in round stock. Drill a series of holes from 1/16 to ½ in. along the centerline of one V-block.



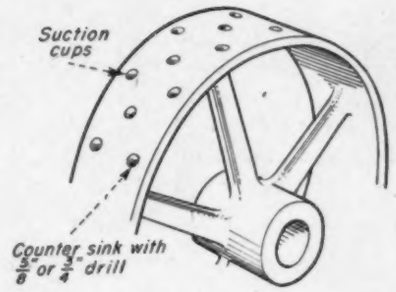
WHEN DISMANTLING machinery, throw all the small parts into a canvas square with rings stoutly sewn to the four corners. When the teardown job is finished, gather up the four corners of the canvas and hang on a peg. Now the parts are safely kept together while repair work proceeds. When re-assembly is called for, take down the canvas pouch, spread out the parts neatly, and proceed with the job without having to hunt for small parts kicked around on the floor.



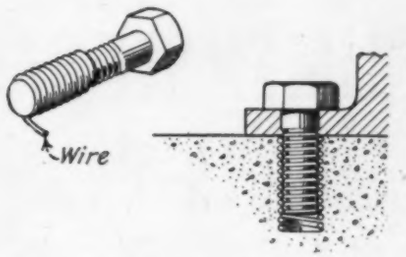
TO RESTORE "bite" of a screwdriver, lay one edge on an anvil and tap the opposite edge with a hammer. This will burr and thicken the point so that it will grip the slot of machine screws satisfactorily. Thus, there is no need to file or grind back the point, as is commonly done.



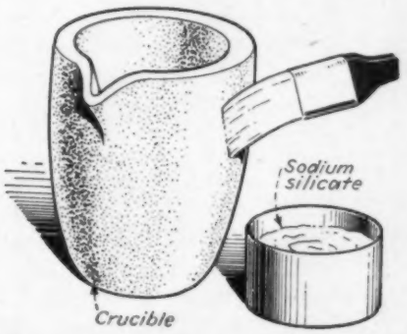
A TEMPORARY "soft face" for a ball pein hammer can be made from a scrap of leather or rubber belting. Punch holes at opposite ends of a strap that will wrap snugly over the hammer head. Slip one hole over the ball end, then the other end, and push the snug-fitting loop over the hammer face. A full blow can be struck without marring the work.



COUNTERSUNK SPOTS in the face of a pulley often help give extra traction when a belt slips. Drill the spots with a ⅝ or ¾-in. drill. They help to increase traction by acting as suction cups.



TEMPORARY ANCHORS for machines can be made in this fashion. Wind wire around the threads of the anchor bolt. Then set the assembly in the concrete foundation or grout before it hardens. When the machine must be placed elsewhere, it is a simple matter to unscrew the bolt.



PROTECT CRUCIBLES against dross and slag by painting them inside and out with sodium silicate solution. Dry the crucibles and anneal in the customary manner. Often a cracked crucible can be salvaged by painting the crack several times with the solution.

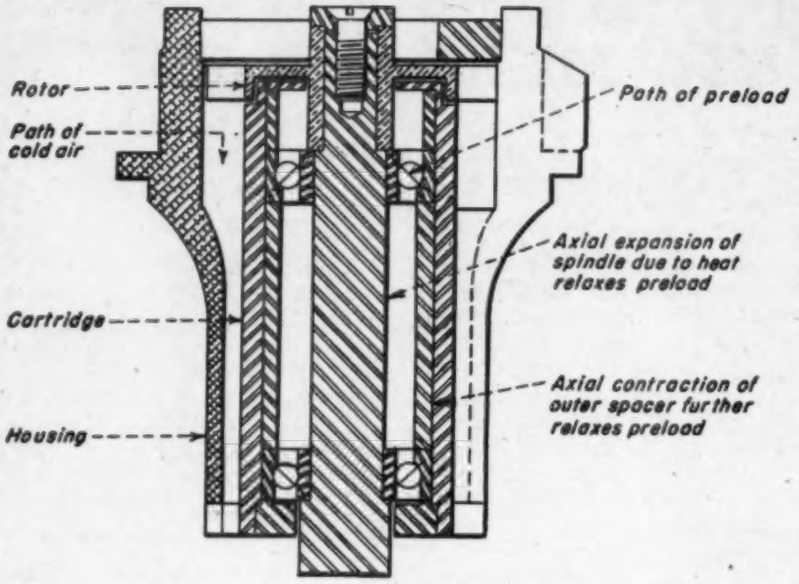


Fig. 1—In preliminary design of a 50,000-rpm. spindle, thermal expansion and contraction adversely affected spindle accuracy by their effect on bearing preload

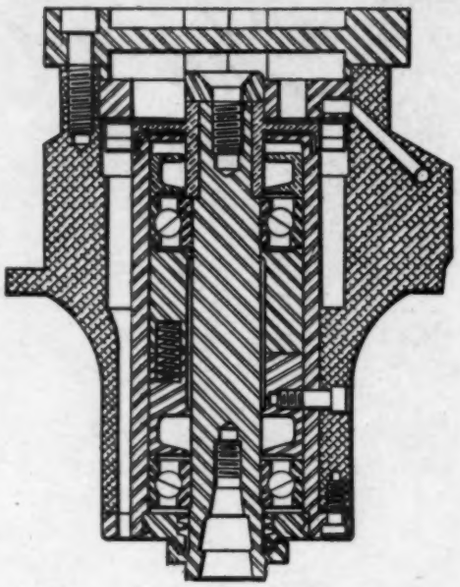


Fig. 2—Dimensional instability was eliminated in the revised spindle design by allowing the upper bearing to float axially and providing a spring preload

DIMENSIONAL INSTABILITY
Affects Design of Precision Equipment...I

BY FREDERICK C. VICTORY

CHIEF ENGINEER, MOORE SPECIAL TOOL COMPANY

IN DESIGN of precision machines and tools, the engineer inevitably faces dimensional instability. Whether recognized or not, this problem presents a challenge. Failure to anticipate or solve it will compromise the accuracy of equipment.

Little has been done to compile information on this vital phase of design and to present it in proper relationship to other engineering considerations. The truth is, unless an engineer is working in "tenths," he is unlikely to be disturbed by unexplained dimensional variations. And even if he is working with precise mechanisms, he is prone to dismiss isolated phenomena as occupational obsessions. It is not until a definite pattern of evidence emerges that dimensional variations are recognized as the effect of dimensional instability from various causes.

Once the problem stands revealed, there remains the time-consuming task of discovering reliable sources of information on various aspects of dimensional instability. This is itself a problem. For it is necessary to review the findings of many research workers, physicists and metallurgists. Often information must be traced to an authoritative but obscure source. This task is not often practical for the engineer engaged in commercial pursuits.

It was from experience with these two problems—recognizing dimensional instability, then curing certain examples of it—that this series of articles was conceived. The subject requires amplification and further collation of data. It is hoped that readers will be stimulated to add information on the subject, by drawing upon their own experiences.

DIMENSIONAL instability may be broadly defined as any change, not resulting from wear or abrasion, in dimensions or shape of any unit, part, or assembly.

Because of the variety of sources of instability, it may manifest itself in many ways, thus making detection and identification difficult. The change may be temporary or permanent. In the first case, instability usually results from extraneous causes, and thus introduces a variable into the problem. Where change is permanent, it frequently can be identified with structure of the material, and it may be virtually instantaneous at any time after machining or progressive over a long period of time.

The following causes of dimensional instability are most frequently encountered:

1. Thermal expansion.
2. Unstable constituents in the material.
3. Stresses in the material.
4. Applied stresses.

The order of enumeration does not represent the relative importance of the various causes, but merely serves as a reference list for discussion.

Thermal Expansion

Thermal expansion is the predictable dimensional change in any part resulting from variations in the temperature to which it is subjected. This may be expressed as the product of the length of the section affected, the range of temperature change in degrees, and the thermal coefficient of linear expansion (expressed in terms of the correct temperature scale) for the specific material in question.

To appraise the effects and consider corrective measures for troublesome thermal instability, it should first be examined for cause.

Basically, there are two sources of temperature change which can exert an influence on any member: (1) heat generated within the part or assembly itself or resulting from its operational cycle, and (2) induced temperature changes usually resulting from atmospheric heat variation or contact with a body differing in temperature from the one under consideration.

Specific sources of temperature change in machines include:

1. Electrical equipment—motors, lights, controls, transformers and electro-magnets.
2. Hydraulic systems.
3. Gears—particularly at speeds where excessive churning of lubricant develops.
4. Bearings, ball or plain, reciprocating or rotating.
5. Actual machining of workpiece.
6. Pneumatic systems—these are capable of raising or lowering temperature.

Various undesirable effects of thermal expansion, insofar as machine design is concerned, are:

1. Change in preload of ball bearings.
2. Distortion from unequal response to temperature variation.
3. Change in bearing clearances.
4. Variation in backlash or gear trains.
5. Relaxation of shrink- or press-fitted members.
6. Errors in workpiece resulting from expansion of locating or controlling members.

Evaluation of these sources of trouble is dependent upon a knowledge of limiting factors, such as: calculated range of temperature variation, extent of permissible movement resulting, and possible steps to eliminate or minimize movement.

A typical example of the effect of thermal expansion from a combination of causes 4 and 6, and the resulting change in the preload of a pair of ball bearings, will show the necessity for considering this factor in design.

Loss of Preload

The design in question is that of a high-speed grinding head, Fig. 1, driven by a pneumatic turbine. As originally conceived, the design involved a positively preloaded pair of ball bearings within a steel cartridge. The bearings, at operating speeds, developed a certain amount of heat, causing an axial expansion of the spindle, which in turn resulted in a relaxation of preload. This condition was further aggravated by

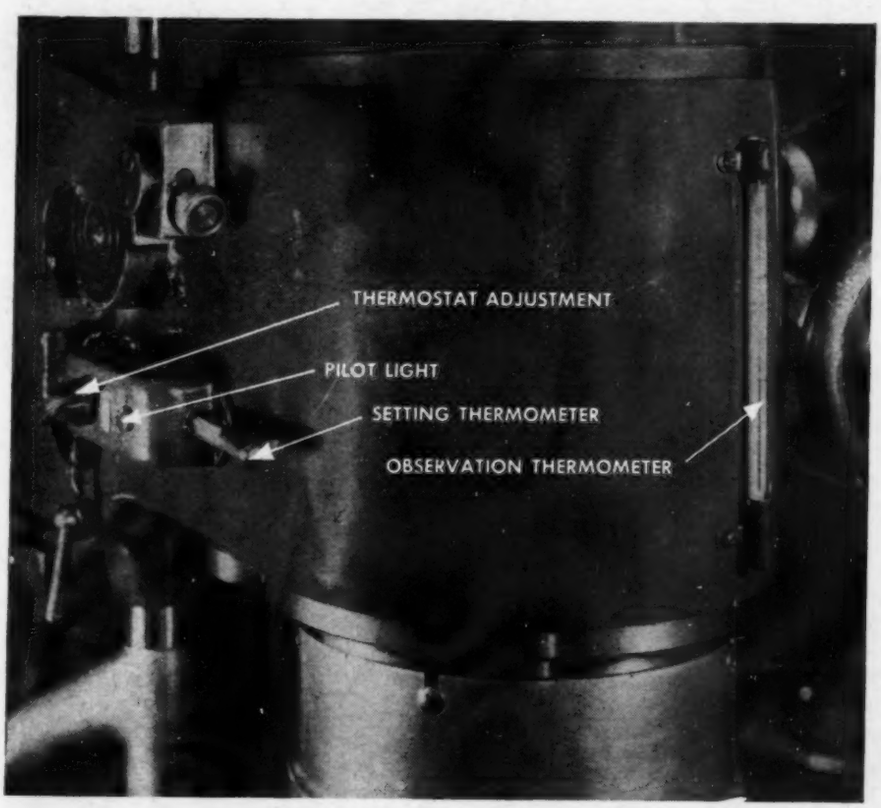


Fig. 3—Preliminary attempts to overcome thermal expansion in the main spindle of the Moore jig grinder consisted of an electric heating element (buried in casting) controlled by a thermostat set to maintain a uniform temperature equal to that of normal operation. This device becomes operative during downtime of the machine to equal thermal output of the bearings

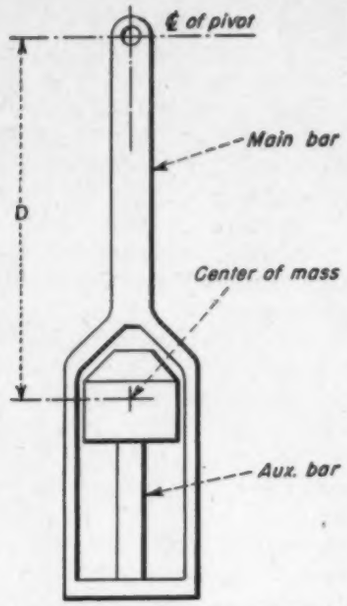


Fig. 4—If two elements of a mechanism are of unequal length, equal expansion can be obtained by choosing materials with suitable coefficients of expansion

the cooling effect of the expanding exhaust air passing around the outside of the cartridge, resulting in an axial contraction of the adjacent outer spacer. The net result was such a decrease in preload as to render the spindle inaccurate for precision grinding.

The solution lay in a redesign, Fig. 2, which permits the upper bearing to float axially and provides for a spring preload.

Obviously, the first consideration in attacking a problem of thermal expansion is to strike at the source. Frequently, foresight in design makes it possible to isolate or insulate the source of heat from critical members.

Unfortunately, in the case of gears and bearings, this approach is not often practical, and these are frequent sources of temperature variation.

Control of temperature is often accomplished by means of a cooling system, usually employing some form of convection fluid and a heat exchanger or refrigerating unit.

It is seldom sufficient, however, merely to employ a cooling system alone. In order to accomplish the desired result—a constant temperature—some form of control must be included in the circuit. This generally takes the form of a thermostat of standard or special design.

To simplify the problems attendant to the incorporation of a cooling system in the design, it is usually practical to employ lubricating oil as the convection fluid and thereby avoid a dual circulating system. This entails an increase in passage size in order to permit free flow of a sufficient volume of oil to be effective as a cooling medium.

Except in cases where considerable heat must be removed, a heat exchanger employing city or well water as cooling agent provides an economical refrigerating unit.

Heat is also successfully utilized in controlling thermal expansion. The theory in this instance is to maintain the affected member or members constantly at the same temperature as normally attained during the operating cycle. This auxiliary heat source must be arranged to supply heat, while the equipment is inoperative, in the correct amount to compensate for that ordinarily generated. Electric heaters provide the most convenient source of heat and are most responsive to controls. They may be controlled either thermostatically, Fig. 3, or on occasion be interlocked with the control of the machine so as to cut in when the machine is shut off, and vice versa. In the latter case, a nice balance of heat output must be achieved.

Occasionally, the principle of compensation may be found to suit the application. In this case, materials having dissimilar coefficients of thermal expansion are arranged to result in an equilibrium, Fig. 4. In order to maintain a constant distance between the center of mass and the pivot point of the pendulum, the main bar is made from steel and the auxiliary bar from some material having a greater thermal coefficient of expansion, such as brass. By relating the respective lengths of the two bars to their difference in expansion, the effect of temperature change is neutralized.

This method has certain undesirable features such as alignment difficulties and loss of rigidity. This method is particularly useful in connection with locating members, in spite of disadvantages.

Unfortunately, all of the solutions so far presented have at least

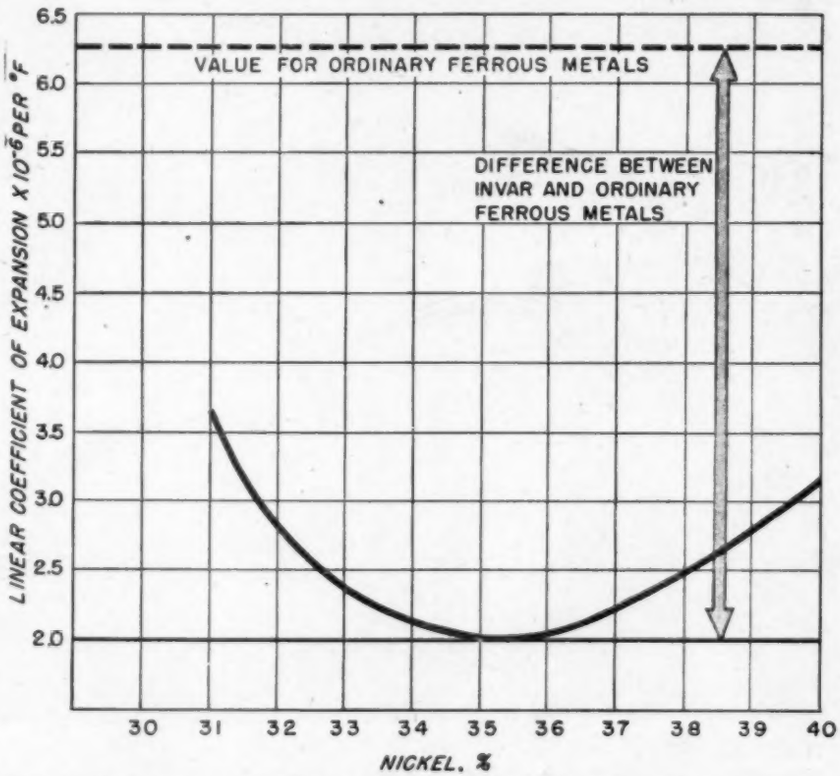


Fig. 5—Nickel content affects the expansion characteristic of the Invar cast iron, but in any case its coefficient of expansion is much less than for ordinary ferrous materials

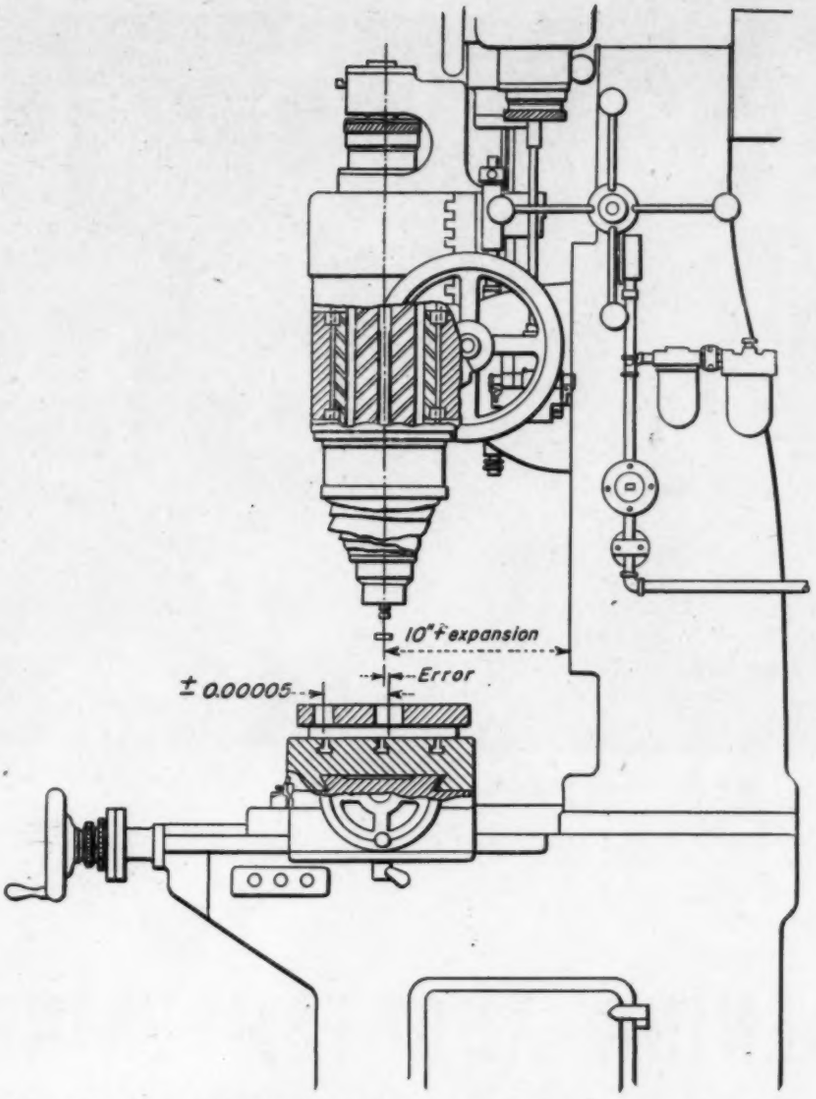


Fig. 6—When the main spindle housing of the Moore jig grinder was made of cast iron, normal temperature rise during operation destroyed the machine's accuracy. By making the housing of Minvar (low-expansion iron alloy), normal temperature rise no longer affects the accuracy established in design

one serious disadvantage. Either the complexity and cost of the machine are increased, or an unpredictable element such as the fallability of controls is involved. In some cases these disadvantages must be accepted as the lesser evil.

There is one other method of combating thermal expansion which has proved satisfactory in many applications. Fundamentally, it is the use of low-expansion materials for critical members where dimensional stability is a major consideration.

Examination of the comparative linear coefficients of thermal expansion for various materials makes apparent the possible gains in this direction. Expansions for various materials per degree F. temperature rise, are:

EXPANSION, inches per deg. F.	
1. Aluminum	0.0000123
2. Bronze	0.0000098
3. Steel	0.0000063
4. Iron, cast	0.0000055
5. Tungsten carbide	0.0000033
6. Invar iron	0.0000021
7. Invar steel	0.0000006

At first glance these values may seem to be so small as to be negligible. This is seldom the case. Each constant must be considered as multiplied by the number of degrees temperature rise, and this product by the length of section affected. For example, an aluminum member ten inches long subjected to a 10 F. rise in temperature will expand 0.0012 in., and a steel piece under the same conditions will show approximately half the change or 0.00063 in., an amount not to be tolerated in most precision applications. A temperature rise of this order is possible from running a pair of preloaded ball bearings at moderate speed, and where other sources of heat are involved much higher values may be expected.

In the case of both Invar iron and steel, the figures given represent the optimum condition, that is a 36% nickel alloy. Both materials are capable of a wide variety of expansion characteristics, dependent upon the exact nickel content, Fig. 5.

It should now be apparent that a substitution of Invar cast iron for ordinary iron and Invar steel for standard analyses will result in a marked reduction in expansion. Quite frequently this step alone will reduce sufficiently the effect of thermal expansion as to render it negligible, Fig. 6.

Excessive Spindle Movement

High accuracy was attained in the Moore jig grinder through the use of Minvar (tradename for Invar-type cast iron) for the main spindle housing. Prior to the use of this low-expansion alloy, the outboard end of this housing warmed up in operation as much as 10 F. above room temperature. The 10-in. long section connecting the bearing pockets with the column mounting exhibited a mean temperature rise of about 6 F., which produced a spindle movement of 0.000036 in. per inch, or a total movement of nearly 0.0004 in. This was obviously not permissible in a precision machine designed to work to tolerances of 0.0001 in.

Care must be exercised in the specification of low-expansion alloys in order to avoid relative movement, during temperature variations, between members requiring a constant relationship.

Part II of "Dimensional Instability" will be published in an early number.

Old tempering method in oil meant careful watching of thermometer, discoloration of watch parts, gummy oil hard to move and a fire hazard from low flash points

New bright-tempering method gives far better results than oil tempering with less care and work. Parts are placed in nichrome containers, heated under hydrogen atmosphere and cooled in the retort before exposed to air by setting it in an air-blast cooling unit

BRIGHT HARDENING AND TEMPERING

Bright tempering with hydrogen eliminated part discoloration and degreasing, gave greater production, finer finish

BY HARRY L. HOVIS, Works Chemist,
and A. W. MARKS, Heat-Treating Foreman
HAMILTON WATCH CO.

DRAWING or tempering of watch parts and small tools at Hamilton was always done in oil. The chief objection to this was the discoloration of work when drawn at temperatures exceeding 500 F.

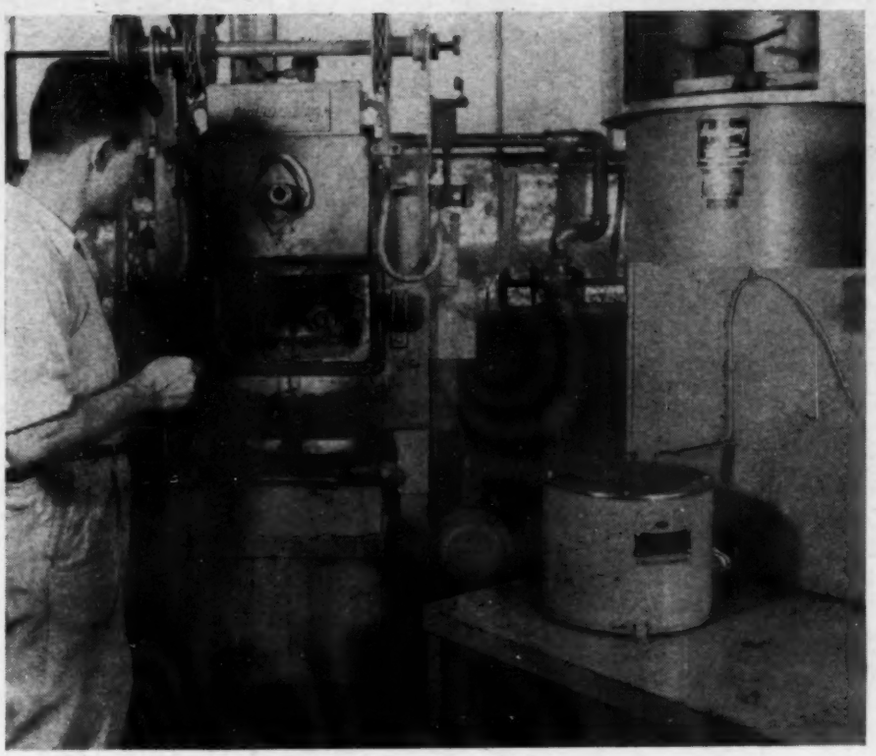
The oil also became quite heavy and difficult to remove from small watch parts. Drawing at high temperatures also created a fire hazard, because the flash point of most quenching oils is quite low, usually less than 500 F.

The supplier of the bright-hardening unit had drawn some satisfactory work for us in a sealed retort unit. One of these units was then purchased for our application and H_2 gas used. To prevent any future difficulties because of contamination from rust and scale, both retort and work baskets for the unit were made of nichrome.

A study of this equipment showed a slight variance in temperature of the control pyrometer and the work because of the normal heating lag. To determine the exact temperature of parts, a dial-type thermometer was inserted into the retort. This thermometer also indicates work temperature after the retort is removed from the furnace for cooling. This temperature must be known, so the work will not be oxidized by opening the retort at too high a temperature.

The following general procedure has been established and used successfully during the past several years. To arrive at this procedure, tests were conducted to determine the length of time required for purging the retort, the rate of gas flow and also the best type of gas.

Various parts, grouped according to their drawing temperatures, are placed in small nichrome baskets with proper identification with respect to lot. Baskets are then placed in a holder and put into the



Salt-bath quenching unit is mounted on a castered table so it can be moved to the hardening furnace when work is to be given isothermal-transformation treatment, usually with quenching at 400 F. and tempering at 450 to 600 F. This unit, thermostatically controlled, is excellent for quenching small tools

TINY PARTS...II

retort which is sealed by replacing the lid and securely bolting it against a suitable gasket.

Gas is passed through the unit to remove air, this requiring approximately 10 min. at 4.5 psi. The exhaust valve is then closed, and the pressure of the H_2 gas maintained by keeping the intake valve open.

After purging is completed, the sealed retort is placed in the furnace and slowly heated until the proper temperature is reached. This requires approximately 30 min. Parts are held at this temperature for the time required to obtain the desired hardness after drawing.

Temperatures also vary for the different parts depending on the required hardness or temper. They range from 475 to 650 F., while the time at temperature is usually 10 min. These temperatures were determined for bright drawing by actual hardness test (Tukon) on the parts. Hardness ranges (48 to 61 Rockwell C) had previously been established for the parts for the conventional oil-tempering process.

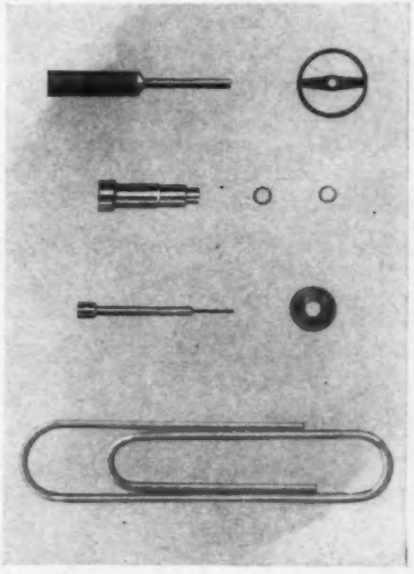
When the tempering operation is completed, the retort is removed from the furnace and transferred to a cooling unit in which a blower passes air over the retort. When the temperature has been reduced, as indicated by the thermometer, to a point where no discoloration is obtained when parts are exposed to air, the gas is turned off, the retort opened and the work removed.

Results are satisfactory. Parts are bright and require no further cleaning. Because of the reducing effect of the hydrogen, parts in most cases are cleaner after drawing than before. Other advantages obtained from bright drawing are:

1. Elimination of discoloration.
2. Elimination of the use of oil and therefore removal of oil from parts after drawing.
3. The number of lots drawn at one time has nearly doubled
4. Bright drawing permits processing of parts in the as-hardened condition to improve finish. The final draw is applied after the parts are highly polished and finished.

In establishing the bright-drawing procedure, tests were conducted on various gases for use in the operation. Use of hydrogen gas always presents a potential hazard, so others were tried to determine their merits. Among these were helium, nitrogen, carbon monoxide, forming gas (90% nitrogen and 10% hydrogen) and also nitrogen-hydrogen mixtures in 70 to 30 and 80 to 20 ratios.

Gases were tested under varying conditions, such as length of time for purging the retort, change



Small-tool hardening, when carefully controlled, can give such results as: 0.0265-in. dia. punch (upper) for balance wheel of 0.032-in. thick stock—131,300 pieces and still good; 0.48-in. dia. punch (center) for winding wheel hub of 0.015-in. thick stock—45,000 pieces and still good; 0.0195-in. dia. punch (lower) for upper endstone cap of 0.027-in. thick stock—154,182 holes and still good

Stationary salt-bath unit, next to an atmosphere-controlled hardening furnace, is built of stainless steel, with the bath heated by immersion heaters and agitated by an electric mixer. Work is quenched in mesh container in bath

in gas flow and also pressure in the retort after purging. Hydrogen was the only one that gave consistently satisfactory results. Helium gas was found fairly satisfactory but inconsistent. Forming gas also showed some promise, but again considerable discoloration was obtained. Hydrogen is still in use, but additional work is planned to eliminate this hazardous gas if possible.

Hardening of Tools and Dies

One of our most difficult problems in the heat-treating department is the hardening of small tools such as taps, drills, punches, saws and pinion cutters. This is particularly true for the extremely small drills and taps, ranging from 0.009 to 0.020 in. in diameter, and for 0.004- to 0.006-in. thick saws for slotting small screws. Our pinion, or gear-tooth, cutters range from ½ to ¾ in. in diameter and, because of the smallness of pinions being cut, tooth dimensions on these cutters are unusually small.

Most of these items in the past were hardened by the charcoal-pack method described in Part I for watch parts, and the disadvantages there listed also prevailed for small tools. The increased heating rate in bright hardening and the greater uniformity in heating has resulted in better structures, higher physical properties and greater production. Slotting-saw production, for example, has tripled.

Many of our requirements are not basically sound from a mechanical standpoint, because we are blanking and piercing holes in stock smaller in diameter than the stock thickness. These conditions require the best-quality steels and materials and also a thorough knowledge by the heat-treater of the mechanical requirements for the particular tool.

Through proper selection of tool steels, bright hardening can be accomplished on small cutters with a minimum of distortion and detrimental surface condition. Use of our bright-hardening equipment for heat-treating of tools has been limited to the smaller items as the volume of watch parts requiring hardening keeps the furnace operating nearly at capacity. Some additional work is planned on basis of results obtained so far.

Although bright hardening has improved the physicals for watch parts and small tools, we have found that it cannot take the place of the isothermal-transformation process of heat treatment where exceptional physical properties are required. This is true for both watch parts and small tools.

The need for this type of treatment was found when we began the manufacture of watch bands. Hardness and toughness, plus ductility, were precise requirements; this treatment gave desired results. Also applied to marine-chronometer parts, it imparted physicals that could withstand twice the impact as the same steel given conventional treatment.

Actual test results on chronometer winding stops showed the following results: SAE 1335X (regular treatment)—84 lb. required for breaking; NE 9440 (regular treatment)—100 lb.; 1.15 C drill rod (regular treatment)—60 lb.; 1.15 C drill rod (martempered)—109 lb. These tests were later established, using a standard Link tester. Drill rod with regular treatment normally broke at 40 to 50 lb., while parts made from drill rod martempered withstood pressures of 140 to 160 lb.

Impact and Torque Tests

Tests were conducted also on other watch parts for both impact and torque. They showed that parts martempered required an average of 28.9% more weight on the direct break test than parts with regular treatment and 19% greater force for breaking on the torque tests. On the basis of these results, martempering was adopted for parts required to withstand unusual strains.

This same treatment applied to small tools, particularly punches, has yielded equally satisfactory results. One particular 0.0195-in. dia. punch, used for punching 0.027-in. thick rolled strip steel, increased performance from approximately 1,000 pieces to over 150,000. This was the most outstanding, but in other cases the increased performance was as high as 200 to 400%.

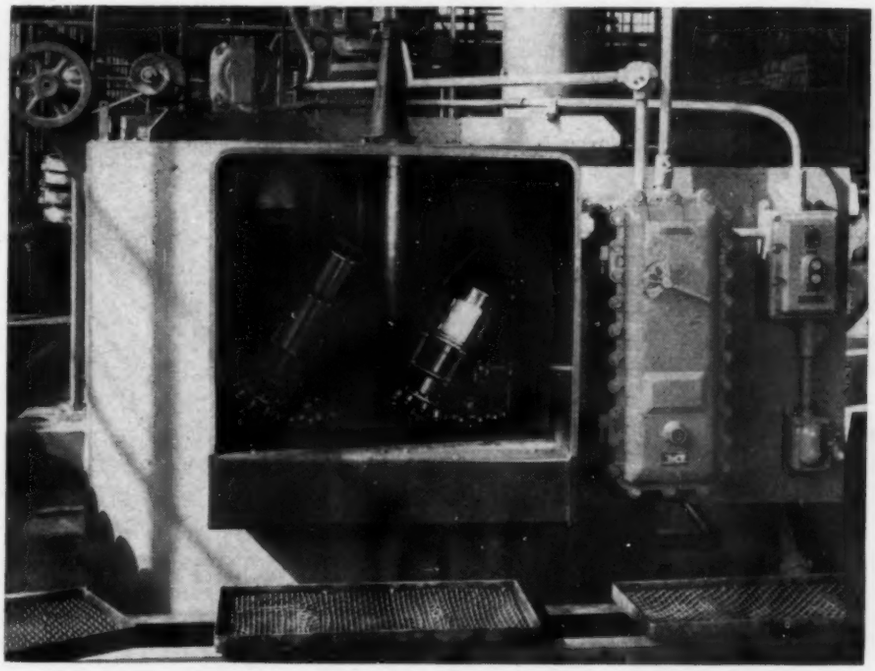
All items given this treatment are heated in an atmosphere-controlled furnace for hardening and

are quenched in salt-bath units. In most cases, work is quenched at 400 F. and tempered at a higher temperature established for the particular part. This will vary from 450 to 600 F., depending on required physicals. It is advantageous in some cases to increase the temperature of the salt-bath quench and eliminate any subsequent drawing. Because of part smallness, salt baths for hardening are not practical.

Two types of salt-bath units are used for quenching work requiring the isothermal transformation. One unit is a small, 1-gal. capacity, pot-type furnace which has been mounted on a small table and made portable so it can be moved to the different hardening furnaces where the work is hardened. This is particularly applicable for quenching of individual small tools, such as punches. This unit is thermostatically controlled and maintained within a 2-F. temperature range.

The other unit is permanently located next to an atmosphere furnace. Constructed of stainless steel in our plant, it has a capacity of approximately 12 gal. It is heated by immersion heaters, and the bath kept in constant motion by an electric agitator or mixer. As the furnace is completely insulated, temperature can be maintained within ±2 F. The unit is also equipped with an air jacket which can be used to lower the temperature of the bath more rapidly.

The advances that have been made in the heat treating of watch parts, small tools and dies, as discussed in these articles, parallel those made in other industries. Because of the special nature of our work, however, it is generally necessary to modify these new advances to make them applicable.



CIRCULAR LAYOUT of a parts washer allows one operator to tend the machine. Robert A. Shaw of the Detroit Diesel Engine Div., General Motors, sketched the machine, which was built by Centri Spray Co. of Detroit. Diesel-engine pistons, liners and wristpins are placed on the inclined holding fixtures as they move around the central column to the loading station. Then as the loaded fixtures move into the spray section, cogs on bottom of the fixtures mesh with a stationary gear, so the fixtures are caused to revolve while being sprayed on outside and inside. Neoprene tubing placed over the retaining rods of the fixtures prevents scoring the work. Solvent drainage is promoted by placing the fixtures at an angle and by causing the fixtures to revolve while draining.

Mathematical Shortcut for Computing New Coordinates

BY DONALD E. SWEET

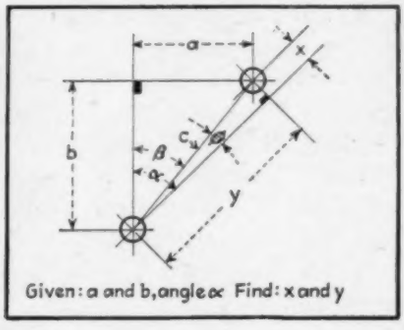
Frequently the tool engineer must change the baseline of a tool or part. When this occurs he must calculate new coordinates for hole locations, as in the case of work that is jig bored. The mathematics involved are tedious and may be troublesome if the engineer is not adept at trigonometry. For, given two sides of the original triangle (the two original coordinates) and the included angle between the sides of the new triangle, he must compute the new coordinates.

Refer to the diagram. The original coordinates a and b are given, also angle α. Problem: to find coordinates x and y.

The formulas are:

$$x = b \sin \alpha - a \cos \alpha$$

$$y = b \cos \alpha - a \sin \alpha$$



Proof of the first formula is:

$$\sin (\alpha - B) = \frac{x}{c}, \quad \sin B = \frac{a}{c},$$

$$\cot B = \frac{b}{a}$$

$$C = \frac{x}{\sin (\alpha - B)} = \frac{a}{\sin B}$$

$$\sin (\alpha - B) = \sin \alpha \cos B - \cos \alpha \sin B$$

$$\therefore x = \frac{a \sin \alpha \cos B}{\sin B} - \frac{a \cos \alpha \sin B}{\sin B}$$

$$= a \sin \alpha \cot B - a \cos \alpha$$

$$= \frac{a b \sin \alpha}{a} - a \cos \alpha$$

$$= b \sin \alpha - a \cos \alpha$$

The above formulas avoid use of the common hypotenuse c in the two triangles shown and likewise angles B and ϕ.

If α is 45°, formulas simplify to:

$$x = 0.7071 (b - a)$$

$$y = 0.7071 (b + a)$$

ROUND TABLE

Ease In or Break In?

"Well, Al, I see you've taken on a new man! How is he?"

"Should I be able to judge in a couple of hours? Give the fellow time to warm up! He had a pretty good line when I talked to him; seemed to know the ropes."

"There's many a good orator getting through the gate these days, Al, and some of them seem to know their ropes so well that it is usually the foreman who gets it in the neck. You haven't turned into an easy mark, have you?"

"Not by a jugful, I haven't. In fact, I've got a new idea—making a study of new men. Laugh all you want to, but I'm going scientific in breaking in a new employee."

"Hm! Pulling off a Taylor, eh!"

"Listen, Ed, this thing of bringing in a new man and starting him right off the bat isn't fair to either the man or the firm—it's even unprofitable."

"Well, well, don't tell me that you're going to let him sit around for a few days to get acclimated!"

"No, not that. Say, do you remember how you used to feel when you landed on a new job? I do; I felt as though I hadn't a friend in the whole world—you know—sort of lost, so to speak, for several days until you got acquainted and got your bearings."

"Yes, Al, come to think of it, I do. I'll admit that a little more consideration would have been a break for me."

"In about ten minutes, Ed, I'm going to have Reynolds take the new man, Harrison, in charge. The first thing he'll do will be to take him in the tool crib and let him see what's available; then he'll make the rounds and make him acquainted with the fellows."

"Then he'll take him over to Clancy's and set him up to a drink, I suppose—all on the company time."

"Now, Ed, don't be a sourpuss. If you're willing to be sensible and listen, I'll go on with my idea."

"OK, Al, you're dishing it up; I'm hungry for more."

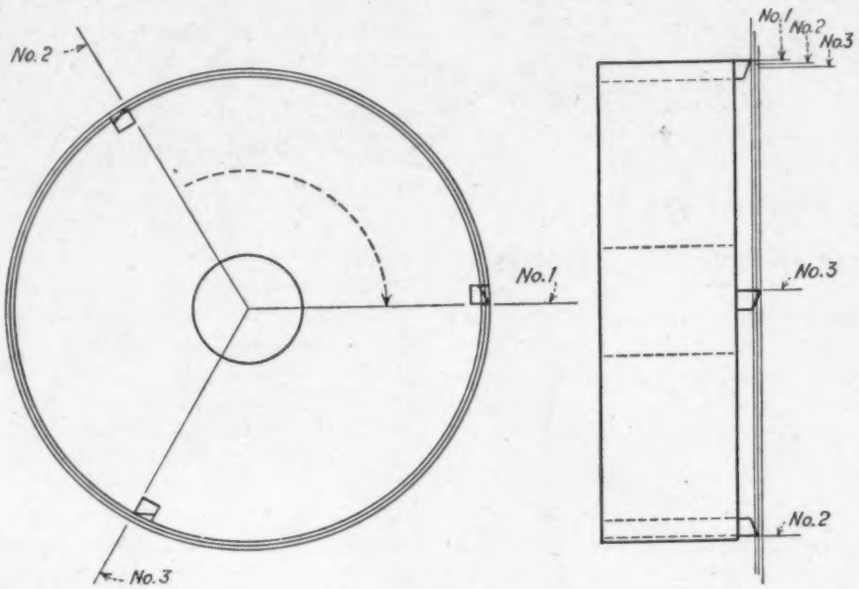
"By this time Harrison will feel quite at home and will be able to produce when I give him his first job. Oh, I'll not give him a big one at first; just something to let him get his hand in. I'll bet that all this might seem like tommyrot to you at first, but you'll come around to my way of thinking."

"There's one thing you haven't taken into consideration; you haven't told Reynolds to put him wise to what a crab you are on Monday mornings," Ed laughed.

"Just how would you feel if the tables had been reversed? I had you beat Sunday night and then the cards turned sour. But wait till next Sunday!"

IS ORIENTATION *worth the time and trouble—or is it better to "rub the new man's nose in the job" in the accepted tradition? Your ideas and opinions can help others; their ideas on earlier topics, appearing on later pages, can help you as well.*

Practical Ideas



Fly-Cutters Are Set Progressively To Distribute Cutting Load Evenly

In comparatively recent years fly-cutters have rapidly increased in prominence as a means of facing machine parts in both manufacturing and jobbing shops, especially where a smooth and accurate surface is required. However, common practice among machinists in making up and setting fly-cutters consists of an attempt to imitate a regular milling-machine cutter or end mill by setting all cutters on an even radial and face line, only to discover after a brief cutting that one cutter is doing most, if not all, of the work.

The progressive setting for fly-cutters shown by the accompanying diagram enables each toolbit to perform its own cutting job independent of the others and insures an accurate and smooth surface. It also permits, in most cases, faster feeds and speeds, especially where carbide toolbits are used. Moreover, the cutter will do many times as much work before regrinding tools becomes necessary.

Toolbit No. 1 is the roughing tool, and takes the outside cutting arc, but the least advanced cut in the face. No. 2 tool is set 1/16 in. inward from No. 1 on the radial line, but is advanced about 1/16 in. in toward the work. Thus it follows behind No. 1 in radial position and progresses with a separate and second cut. No. 3, the finishing tool, is set approximately 1/16 in. inside the radial arc of No. 2, and is 1/16 in. deeper toward the work.

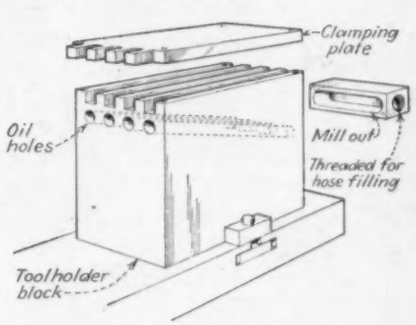
The above general setting is intended for practically all types of material, especially steel and cast iron. However, in cases where an exceptionally smooth finish is desired on aluminum, brass or kindred materials, it is advised to reduce the face setting (advance) of tool No. 3 to from 0.005 to 0.007 in. from the setting of No. 2, and grind the cutting point of the tool slightly rounded.

On facing extra-large surfaces where ½ in. or more stock must be removed, cutters may have 4, 6 or even 8 teeth, but the same progressive setting arrangement should be maintained for best results. *George C. Allen, South Gate, Cal.*

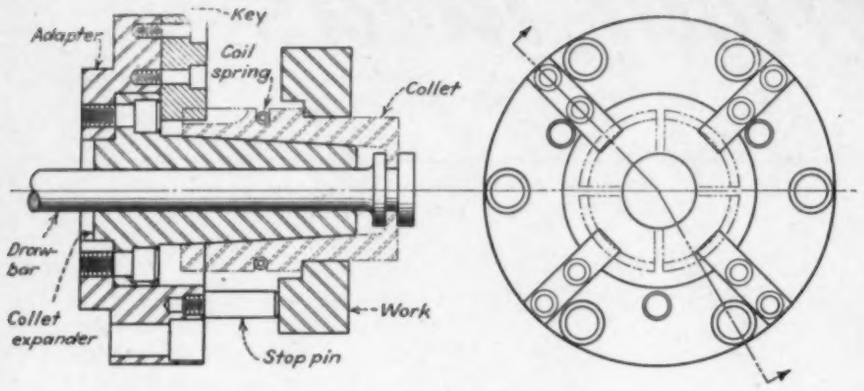
Drilled-Block Feed Cools Cutoff

In order to speed up the production of an order of washers in a job lot, this toolholder block was made to provide for the cutoff of four pieces from the back side of a turret lathe. The tools were lined up, each tool 3/32 in. ahead of the tool behind it, to drop the washers one at a time and to spread out the load on the cross-slide.

The 3/16-in. square toolbits were held in place by a clamping plate that had four projections which backed up the tools. The plate was mounted to the block with capscrews and the block was fixed to the cross-slide by T-bolts which fastened through two lugs welded to the block.



Because the tools were mounted in an inverted position the cutting oil from the regular oil feed could not reach the points, so the four holes shown in the body of the block were drilled at a slant to throw the oil up to the points. The milled-out manifold was mounted at the back of the toolholder and oil was fed through a hose fitting into the holes. *John J. Moffatt, Verdun, Quebec.*

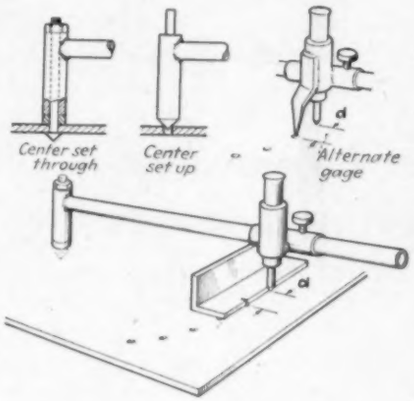


Internal Collet Grips Turnings For Close Concentric Machining

In the course of setting up some special purpose, semi-automatic lathes, the problem of accurately locating and holding work by previously finished bores was encountered. The parts, in small lots and varying in sizes, required that O.D. and bore be concentric within 0.001 in. The collet shown in the accompanying drawing produced parts well within the tolerances.

The spindle adapter is bolted to the machine with six socket-head capscrews through counterbored holes. The collet expander is bolted to the adapter. The expander is hardened and ground, and the O.D. is tapered 3° on the side. The collet proper is also hardened and ground, the outside to fit the work, and inside to the same taper as the expander. After grinding, the collet is split into four sections with an abrasive-cutoff wheel. The circular coil spring holds the collet parts on the expander, and the keys drive the four collet sections. The drawbar pulls the collet back on the expander and the collet expands and grips the work. The drawbar extends through the machine spindle and is operated by a double-acting air cylinder. When the work is loaded, it is pushed back against the three stop pins and the action of the collet holds it against these pins.

To change from one size collet to another it is only necessary to remove the spring and the collet sections, with the drawbar in the forward position. With modifications to suit various machines and work, a collet of this type, if carefully made, will produce work to close limits of concentricity. *George W. Brown, Toccoa, Ga.*



Punch Holder Locates Large Holes

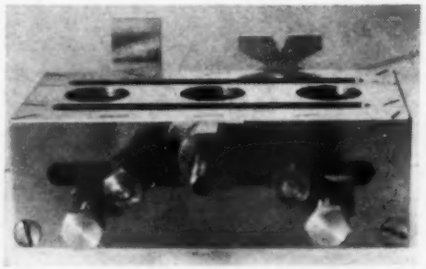
Holes of large diameter can be cut in sheet metal very easily if a punch holder, as shown in the drawing, is used to locate the circumference of the circle. The fixture not only controls the radius of the hole exactly, but also spaces the punch marks along the circumference evenly.

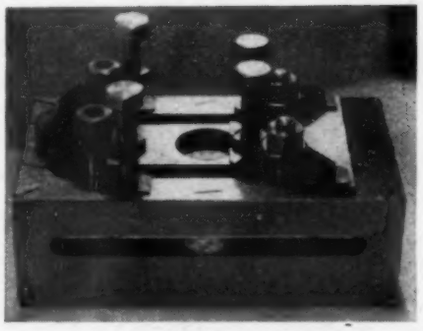
The holder is built up almost entirely by welding standard shapes together. The arm can be either pipe or rod, the centering device is made of pipe with a prick punch used to center in or on the drilled hole at the center of the large hole, and the punch holder proper, at the end of the arm, is formed from pipe and one setscrew. Two methods of centering the fixture are shown. The set-through method is more permanent but has the advantage of being tip-proof.

The gage for locating the punch marks can be simply a marked piece of angle iron, as shown in the assembly, or a sheet-metal pointer. *Doctor-Engineer Hans Schmidbauer, Goggingen b. Augsburg, Germany.*

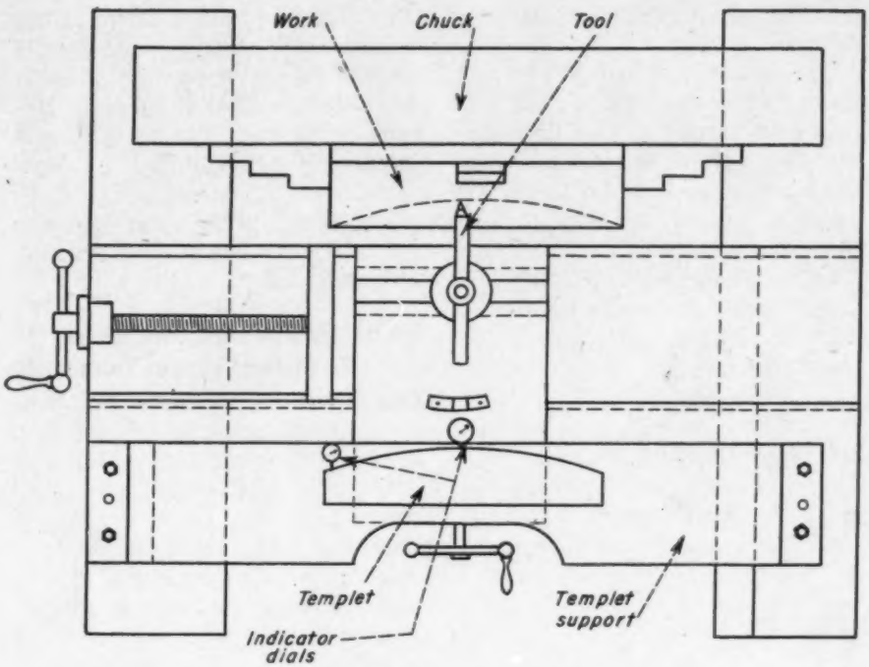
Setup Box Holds Flat Parts

The machining of many small, flat parts of irregular shape was greatly simplified with the use of this setup block. It was made from mild-steel plate, with all surfaces milled and ground parallel and square. The unit is 4½ in. long and 2½ in. wide, with ¼-in. slots and ¾-in. holes in the top. The four clamps are drilled with the center hole clear and the other hole tapped for the ¼-in. bolt. The dimensions can be altered easily to fit any shop requirements. Although it has proved very useful for small drilling and milling jobs, the block has also been used with good results in conjunction with a lathe faceplate. *W. Laycock, Wormley, England.*





Clamps can be made on either the top or sides of this setup block. Bolts with T-shaped nuts hold the clamps



Templet-and-Follower Fixture Controls Turning of Spheroids

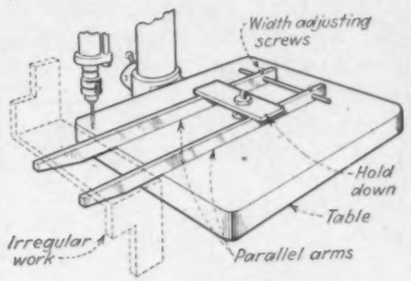
A variety of dies and molds were required with spheroid and spherical, concave and convex faces. The work was of a jobbing-shop nature, and special equipment and methods, other than what we could devise for our existing machines, could not be justified.

A satisfactory low-cost method of turning these shapes was devised using a templet and follower arrangement. A templet support was mounted on the lathe between the carriage and tailstock. It was a bridge affair, with a flat top surface which cleared the carriage crossfeed wheel. On this support the templet was mounted. For rough work this templet was simply a laid-out line on a steel plate which was followed by a pointer. For close work the templet was cut out and finished, and the final cuts were made by following its contour with an indicator dial. In both cases the followers were mounted on the carriage cross-slide, with the pointer adjusted to ride above the scribed line and the dial indicator adjusted to ride against the edge of the templet.

The compound rest was turned on the carriage so that the tool was mounted exactly perpendicular to the work face. Then, after the templet was fixed with its centerline above and parallel to the centerline of the lathe, the tool was moved to touch the center of the work and the pointer was located. This was done by setting the pointer on the intersection of the centerline of the templet and the line between the two extremes of the arc.

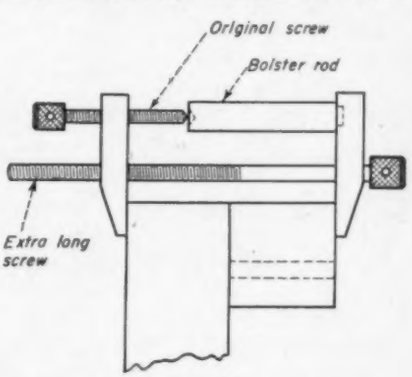
For a concave surface the tool was backed off and moved to the edge of the work, and the first cut was made. Since the power on the cross-slide was used, the advance into the work was made in a number of cuts, each one starting closer to the center of the spheroid. It was necessary to be careful to keep the pointer back (toward the tailstock) of the templet line until the final cut was made.

For a convex surface the same procedure was followed except that the feed on the cross-slide was from inside out, to avoid breaking the tool or damaging the work if the feed got jammed or a mistake was made. For an accurate final cut a dial indicator was mounted instead of the pointer. A cut templet was necessary only if the indicator was to be used, as the pointer required only a layout of the shape. *F. G. Fonquen, Buffalo, N. Y.*



Arms Hold Irregular Drill Work

One way to drill irregular work that cannot be mounted on a drill-press table is to use two parallel arms in conjunction with a hold-down device. Two pieces of cold-rolled steel are milled or shaped together to provide an extension of the table. Holes drilled in the ends of the arms retain a spacing rod by the action of two setscrews. The hold-down is merely a drilled plate bolted to the table. The device is practically unlimited in application, for many sizes and shapes of arms can be made to suit all kinds of irregular work. *Lowell F. Stull, Youngstown, Ohio.*



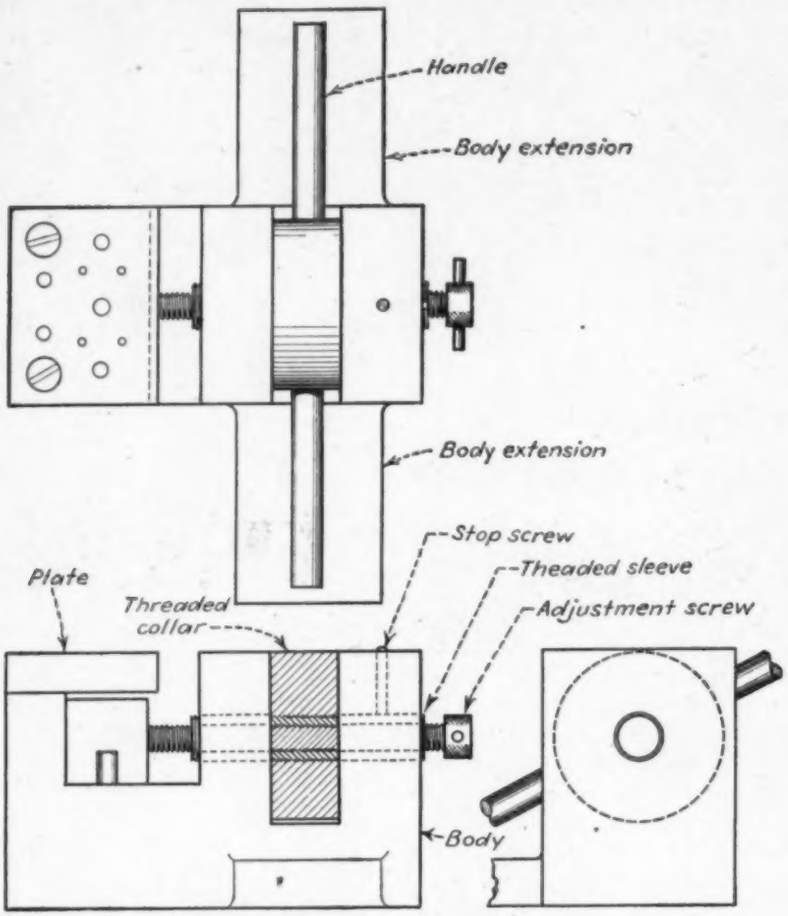
Extended Screw Improves Clamps

Space and weight in the toolbox is saved and it is possible to get much closer to the work if small C-clamps are adjusted to handle work much larger than that for which they were originally planned. An extra-long screw is added to each clamp, and an extending bolster rod is fitted into a

blind hole in one of the clamps. The fit of the bolster rod into the hole should be fairly tight.

In addition, a centerdrill hole is spotted in the center of the other end of the rod. This keeps the short, or regular, screw from slipping. It is an added advantage to have the surfaces of the clamping members surface ground so that it is unnecessary to use parallel bars in some setups.

The greater range of the C-clamp, which can still be used with two short screws, allows the operator to get closer to his work when the clamps are used on larger assemblies, and to grip parallel work more accurately. *Henry Rasmussen, Niagara Falls, N. Y.*



Quick-Acting Fixture Closes Jig With Pressure on Collar Handles

The simple task of opening and closing a jig or vise can be a monumental effort waster, especially if the action is necessary in the production of many small parts that are in the jig only a short time. To make this chore as painless as possible, the design shown has been adopted wherever the shape of the parts will allow.

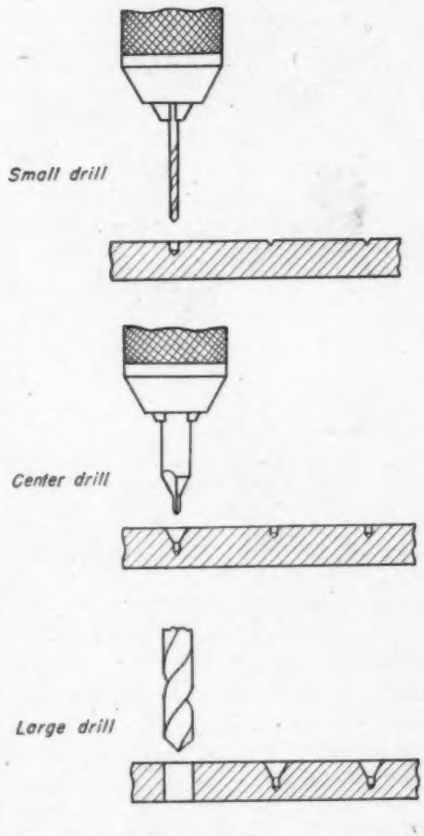
The body of the fixture is cast to include the two extensions which prevent tipping. The fixture and the jig plate are bolted together so that the action of the adjusting screw closes the jig. A slot in the body is machined to admit a threaded collar with two handles pressed into holes on its sides. The threaded sleeve, which is threaded for the adjusting screw inside and for the collar outside, has a slot cut through it to take the stop screw. This stop screw restrains the sleeve from turning, but permits some longitudinal motion.

When in use, the adjusting screw is tightened up to close the jig. The left-hand handle of the collar is depressed, which moves the sleeve and screw forward slightly to make the final tightening. Depression of the right-hand handle loosens the jig. After a slight amount of adjustment, it will be possible to operate the jig using the collar handles only. *H. Moore, Kirkstall, Leeds, England.*

Small, Thin Drill Locates Holes To Critical Layout Tolerances

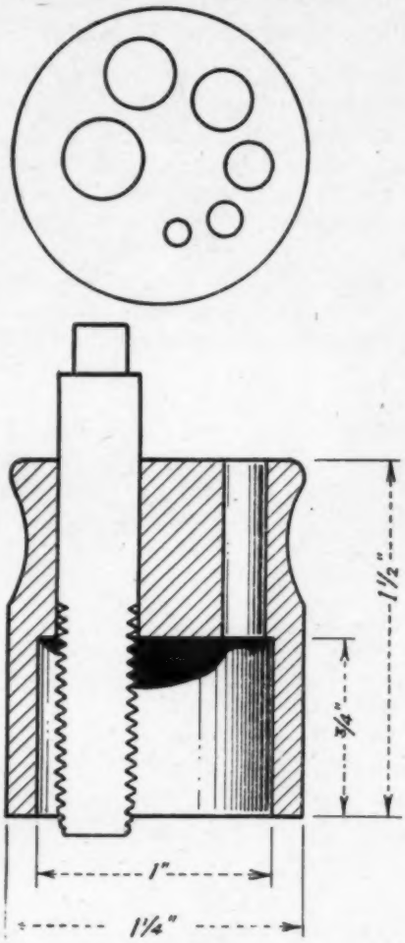
One of the many difficult problems in the manufacturing of tools and dies is the accurate location and drilling of small holes after they have been laid out correctly. A practical and quick method of drilling holes up to about 3/8 in. with accuracy to within two or three thousandths is the following system:

The hole is laid out accurately, using a magnifying glass to prick punch the location. A small centerdrill is selected and its pilot is checked for diameter. Then a long drill of the same diameter as the centerdrill pilot is used in a drill-press to make a hole about 1/8 in. deep. The long drill, because of the



elasticity in its length, will follow the punch mark exactly.

The centerdrill is then used to form a countersink in the hole, and finally the correct size of drill is used to complete the hole. A second, larger centerdrill may be used before final drilling if necessary. The result is a hole that is correctly located to within a few thousandths of its correct spacing. *Harry Stern, Philadelphia, Pa.*



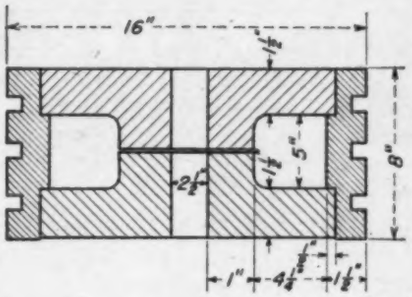
Simple Guide Starts Hand Tap Perpendicular to Work Surface

A simple guide made of cold-rolled SAE 1112 steel will aid the toolmaker in starting a tap at right angles to the surface of the part being tapped. The guide shown has six holes to accommodate taps from ⅛- to ⅜-in. dia. All holes are drilled for a free turning fit. The guide is used by holding it tightly against the work surface with one hand while turning the tap with the other. A few turns will enter the tap far enough so that the guide can be removed. The external groove provides a good grip. The guide can be used in close quarters and for holes close to the edge of the part. *John Beyen, Sidney, N. Y.*

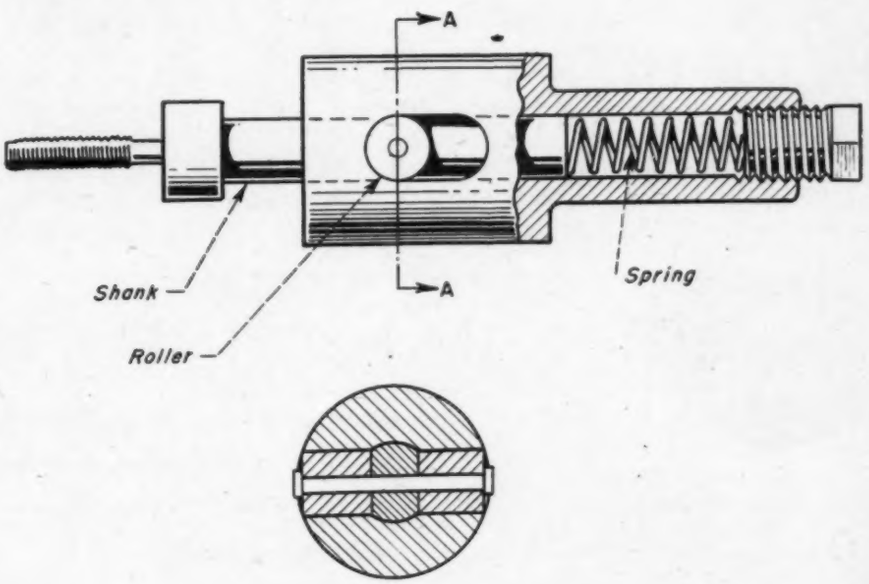
Sectional Piston Simplifies Job When Replacing Worn Component

Where replacements of hollow pistons are often necessary, it may be an advantage to be able to substitute a part that has been made with no casting process involved. A sectional piston, such as might be used for an air compressor, is illustrated in the drawing.

It is made with two sections, the internal flanges, intended to be permanent parts of the compressor. The band, with grooves for piston rings, is machined from either hollow or solid stock, and is assembled to the two flanges with a press fit at the shoulders. With this arrangement, there is no casting necessary, and the replacement of a damaged part should take no longer than with a new cast piston.



With the dimensions of the flanges on hand, it is a short job to turn down a new band and piston rings. *L. H. Hardcastle, Port Arthur, Tex.*

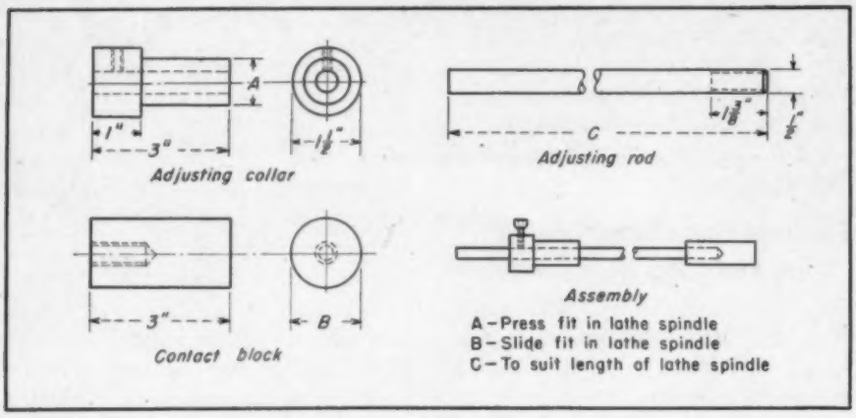


Section A–A

Holder Controls Tapping Pressure

This spring-loaded floating tap holder will make it easy to form perfect threads, all the way to the bottom, in a turret lathe. The skill of the operator is of secondary importance since the spring loads the tap holder.

The end of the tap is entered in the hole, and the holder is advanced forward until the roller touches the end of the slot in which it rides. From this point on the spring controls the pressure of the tap. The only fine points involved in the operation are the setting of the spring with the adjusting screw at the back of the holder, and making sure the depth of the thread does not exceed the length of the slot. The section details the roller mounting. *Luther H. Bobbitt, Independence, Mo.*



Spindle Stop Turns Engine Lathe Into Production Cutoff Machine

An ordinary engine lathe can be set up for fairly rapid production work by the addition of this spindle stop, which is used in connection with cutoff jobs on cylindrical work.

The stop is assembled from a cold-rolled steel adjusting collar and rod and a hardened contact block. The setscrew fixes the position of the contact block. As shown in the sketch, dimensions *A*, *B* and *C* are adjusted for the particular lathe in which the stop is to be used. For operation, the assembly is pushed into the spindle from the rear of the headstock, with the contact block extending out the front end of the spindle. The adjusting collar is pressed into the end of the spindle and locked with the setscrew.

The carriage stop is set, a trial piece is faced off to the exact size required, and the spindle stop is adjusted to bear against the work from the rear. All subsequent operations are performed by simply inserting the work against the spindle stop, locking the chuck, and using the crossfeed of the lathe.

It is evident that considerable time and effort can be saved with such operation of the lathe, whether the job consists of few or many parts. The spindle stop should be useful to machinists who have occasional production jobs which must be done on an engine lathe. *Allen B. Nixon, Springfield, Mass.*

Paper Shims Correct Fit of Jigs

The slightest lift or extra tightness in jigs used for production work on multiple-spindle drillpresses may make a far greater difference in offset of the hole to be drilled or tapped. When jigs are worn and old it may be wise to carry about a bit of tissue paper to shim up the jig where necessary. Common grades of paper range from a half to five or six thousandths of an inch in thickness, so the choice of shim size is nearly unlimited. It should be remembered, though, that paper changes size when wet, so be careful to change the shims often in oily locations. *Henry S. Galus, New Bedford, Mass.*

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Forty-fifth Selection—Martin H. Ball's Floating Reamer

NEWS OF METALWORKING

Government Sounds Warning in Face of Coal Strike Threat; Reserves Low

WASHINGTON — Talk of another coal strike is worrying Washington again. John L. Lewis, president of the United Mine Workers, is writing letters again. This time he has told the soft-coal operators that they are not living up to an agreement to set up a pension plan for miners and that he considered himself free to take "independent action" to enforce last July's contract.

The threatened strike was the main topic of discussion at the annual meeting of the Southern Coal Producers Association in Washington. It was the only thing discussed at the annual dinner, where the operators listened to Cyrus S. Ching, director of the Federal Mediation and Conciliation Service.

Ching warned the operators that the government would not tolerate a coal strike this year and would take all steps possible to prevent one. He hinted that, through Congress, steps beyond the Taft-Hartley Law might be taken if necessary.

The Taft-Hartley Law, through injunction, can only delay the advent of a strike for about 80 days.

Lewis contends that the operators agreed to set up a pension plan when they agreed to the welfare and retirement fund, for which they pay a royalty of 10 cents on every ton of coal mined for sale.

The miners' chief wants a pension of $100 a month for every miner over 60 years of age with 20 years of service.

The operators argue that an increase in the royalty would be necessary. The fund now contains about $30 million after seven months of operation. There is also about $16 million left in the fund raised through the 5-cent royalty under the Krug-Lewis June agreement.

First reviews of industry's preparedness for a coal strike showed that the mine workers have a strategically favorable position if a strike should develop.

Because extreme cold in January and February reduced normal coal reserves, several of the larger steel companies are reported to be in no position to withstand a spring strike. They might have to cut back operations as much as 50% if the strike should last a month.

With demand for steel still increasing, and the shortage almost as bad as it was a year ago, a strike would mean a drop in second quarter quotas for steel consumers. It would, of course, upset the government's plans for special allocations to essential groups even before the plan is worked out.

If the normal pattern is followed, too, there will be spontaneous walkouts before the strike deadline which will increase pressure on operators.

W. M. Fairbairn Heads Barnes Drill Co.

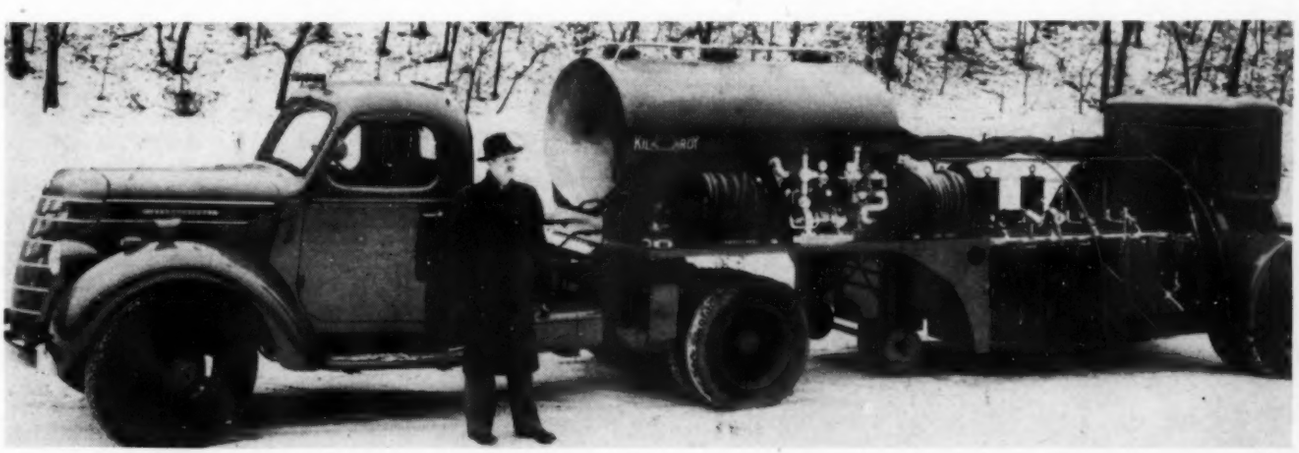
ROCKFORD, ILL. — W. M. Fairbairn has been elected president and general manager of the Barnes Drill Co. and A. M. Johnson, chairman of the board.

Other appointments included: Reed M. Andress, executive vice president; A. G. Block, vice president, secretary and treasurer; Roger Marriott, vice president and assistant treasurer; and Harold Johnson, vice president and assistant secretary. John E. Andress, director, will continue as advisor and counselor.

Stampers' Steel Inventories Low

NEW YORK—More than two-thirds the pressed metal manufacturers started the year 1948 with an average of 45% less steel in inventory than last year and over 90% do not expect to receive any more steel this year than in 1947 or to obtain sufficient steel for their needs, according to Tom J. Smith, Jr., President Pressed Metal Institute.

Mr. Smith stated that these figures were based on a survey which included returns of over 20% of the membership located in 11 states.



Portable Filling Station, designed to service heavy construction machinery, is shown with John H. Adler, Pittsburgh, the inventor. On-the-ground servicing of large planes and means of pre-testing sites for filling stations are possible uses for this unit. A 700-gallon gasoline and diesel fuel tank system, two batteries of nine-hose reels each, quantities of water, anti-freeze, diesel lube oil, kerosene, hoist and jackhammer oil are contained in the unit. All operations are air controlled. The new machine is built by Jax, Inc., Pittsburgh

Farm Machinery Industry Optimistic For 1948 After All-Time Sales Peak

CHICAGO—An all-time sales record estimated to total well over $1.25 billion was set by the farm machinery industry during 1947. This does not include large numbers of tractors produced by the industry for non-farm use. Including these tractors, sales volume probably totals in the neighborhood of $1.5 billion. Bureau of Census figures for the industry show a total of $886,451,091 for 1946 ($1,015,862,238 including tractors for non-farm use), and $750,546,952 for 1945 ($1,460,926,357 with non-farm tractors).

The record for 1947 was achieved in spite of shortages of critical materials (especially sheet steel and malleable castings), work stoppages caused by strikes and an inadequate supply of skilled workers. Settlement of the Allis-Chalmers and J. I. Case strikes in the spring of 1947 aided materially in increasing the flow of tractors and other units.

Demands Exceed Output

Although 1947 sales of farm machinery reached an all-time high, the industry still was not able to satisfy increasing demands. The industry is optimistic about prospects for 1948—in fact, leaders in the industry look for several more years of high production demands if expansion programs are to be taken as a measure. The volume of goods produced during 1948 will, however, depend to a large extent upon: (1) demands made upon the industry by organized labor, (2) availability of needed materials, (3) expansion of production facilities, and (4) imposition of government controls that may be made necessary by the Marshall Plan. In addition, the full effect of the recent break in price of grain and other commodities has not been measured. While government parity price support programs may be continued indefinitely, farmers traditionally are sensitive to price movements and their future purchases will be affected by the market.

The story about the "black market" in farm machinery is being told in Washington at hearings being conducted by the House agriculture committee. Representatives of a number of leading manufacturers in the farm machinery field received invitations from Rep. Clifford Hope (R-Kan) to appear for testimony at the hearings started on Feb. 10. Most observers doubt if anything new will be developed at these hearings.

Of interest also is the recent appointment of 20 representatives of the industry by Secretary of Commerce Harriman to an advisory committee to consider participation of the industry in a voluntary agreement under Public Law 395. The committee is made up of representatives from large, medium and small farm machinery and equipment manufacturers. It will be asked to consider feasibility of entering into voluntary agreements to increase production of items urgently needed to meet food requirements.

Most farm machinery manufacturers have been holding their export sales to percentages existing before the war. For the larger producers, this averages from 10 to 15%, depending on type of product. What the export market will be during 1948 depends on government assignments to E.R.P. (the Marshall Plan). Bureau of the Census reported exports totaling $85,142,084 for 1946 and $89,080,542 for 1945. Total for 1947 is not available now. Producers already have allocated about $90 million worth of machinery and parts for export during 1948, which is not too far from the totals called for in modified versions of E.R.P. They do not expect their export business to be greatly enlarged by approval of the program unless some of the large requests made at the Paris conference are reinstated.

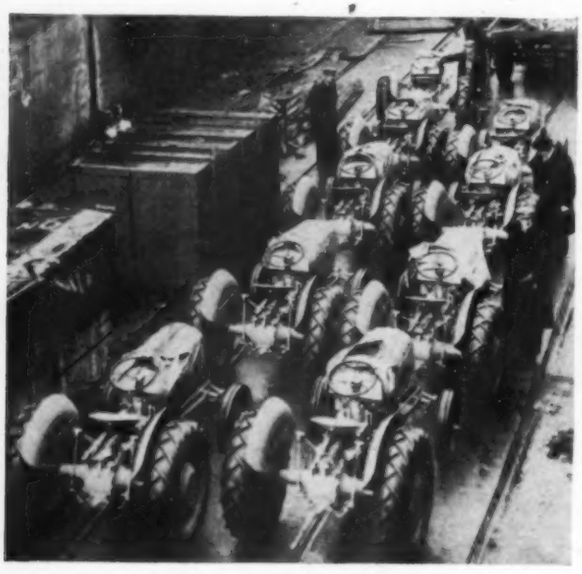
Expansion Completed

International Harvester Co., now completing a $134 million expansion program, sold more than $316 millions of equipment and service parts to U. S. farmers during 1947, out of a sale volume totaling more than $741 millions. Exports were 14.6% of total sales; only one-third was farm equipment. Expansion includes a new tractor plant at Louisville, where the Farmall Cub is starting to come off the production lines, the new Melrose Park engine plant near Chicago, a new plant for cotton pickers and hay balers in Memphis, and the Evansville Works where domestic and agricultural refrigerating units are being made. These new facilities are expected to get into full production during the coming year.

Deere & Co., second largest farm equipment manufacturer, had sales in 1947 totaling $212 millions, compared with $145 millions in 1946. Sales in 1947 exceeded those of any previous years. This organization also has had a large expansion program during recent years. A new tractor plant on which construction was started at Dubuque, Iowa late in 1945, was completed during the first half of 1947. Demand for tractors made at this plant is such that production facilities already are being enlarged. In addition, the Des Moines Ordnance plant in Ankeny, Iowa, has been purchased for conversion to the production of corn pickers and other products. Other plants are being expanded and modernized to take care of continued high demand for the company's products. More than $17 millions was spent on expansion during the most recent fiscal year.

J. I. Case, Allis-Chalmers, Caterpillar Tractor, Minneapolis-Moline, Oliver Corp., and many other important units in the farm machinery industry also have spent large sums on plant expansion and modernization since the war. Oliver Corp., for example, has spent nearly $13 millions in improving production facilities and purchasing new production equipment in the three years ended October 31, 1947. This company's net sales during the fiscal year ended October 31, 1947 totaled almost $74 millions, an increase of 45% over the previous year.

Ford Motor Co's. Highland Park Plant made 85,589 tractors and more than 15 million pounds of tractor service parts during 1947.



British-Built Ferguson tractors for the United States, the first shipment of $20 million worth, are loaded aboard the American transport American Farmer at Victoria docks, London. Vessel is bound for Philadelphia

Detroit

FORD BEGINS CHANGEOVER TO 1949 MODELS . . . LAYOFFS UNDERWAY AT ROUGE PLANT . . . SHORTAGES OF SKILLED MANPOWER IS FELT

The long-awaited changeover to 1949 Ford automobiles has begun at the Rouge. Present layoffs are relatively minor, and concentrated in departments with long lead-times, but they will be slowly accelerating between now and mid-Spring, preliminary to resumption of output on the new jobs, probably in May.

The company itself was silent on the timing and lengths of the changeover layoffs. From the United Auto Workers came an estimate — obviously rather conservative — that 7,000 workers will be involved, and that shutdowns will run from one to six weeks in the various departments.

The first changeover layoffs in the Ford empire came in January at the Lincoln plant, where output on that model was closed down, preparatory to shifting over for 1948 models during this month and March. The changeover extended on Feb. 13 to River Rouge, when the Mercury assembly line was shut down, idling about 300.

More Layoffs Due

Thenceforth, layoffs were expected in a variety of manufacturing departments producing for Ford, Mercury and Lincoln alike. In fact, some few long lead-time shops already had curtailed their skilled forces modestly around year-end, after completion of their new-car assignments.

Ford, apparently, is bothered with the same shortages of skilled manpower reported in recent weeks by the U. S. Employment Service. The company made known to its employees in plant newspapers that it "urgently" needed pipefitters, electrical construction and electrical maintenance men. In all, about 150 were sought, to help install new machinery and relocate present machinery and equipment.

Employment in all Michigan plants was rising until late January, when the cold wave shut off industrial gas supplies, resulting in indefinite layoffs for close to 200,000 men in Detroit alone.

Output Reduced 20,000

These layoffs reduced production of cars and trucks from the earlier levels above 100,000 units a week down to about 80,000. Chrysler and Packard operations in particular were affected.

In addition, manufacturing of parts and accessories in the Detroit area slumped sharply. This was not felt by the final assemblers at once, but when empty spaces in the supply pipelines reach user points later on, they will likely affect operations.

However, on the bright side, production of bottleneck steel was reported continuing without great change. This was presumably building a slight float of tonnage which will be available later on, and which should result, therefore, in enlarged output rates after the Detroit factories get back to work.

Activity in the machinery shops continued steady. The tool and die companies moved in February operating in excess of an average 47-hour week, the best level they have achieved in more than a year. Also, their employment was reported up modestly.

New Olds Engine Due

Some deliveries are being made from machine makers to Olds, for use on a new engine which is expected to be seen less than a year hence, on 1949 models. This program is being pushed quietly, without creating any real ripple of excitement, but serving nevertheless to bolster today's backlogs.

On the score of developments for tomorrow, rather well-founded rumors are that one passenger car maker will employ, for 1949, the first major automotive application of magnesium—car wheels. The wheels will be die cast. Physical strength, a question raised when magnesium is discussed, would seem to be sufficient when it is recalled that wartime aircraft wheels, subject to intense stressing, were of this material.

Harry Ferguson, Inc., tractor manufacturer, surprised the community with announcement that it has let contracts for a group of four buildings on Detroit's West Side, and hopes to be in production on its farm implements by August.

$10 Million Cost

The buildings and tooling for them will cost an estimated $10 million. Engines for the new tractor will come from Continental Motors Corp.; other principal suppliers include divisions of General Motors, Borg-Warner, Kelsey-Hayes, Bendix Aviation and others.

Kaiser-Frazer Corp., meanwhile, has expanded its already-substantial wedge in the steel industry by buying a blast furnace and coke ovens in Utah from the WAA. Cost was $1,150,000. The capacity of 300,000 tons of pig yearly will be used for K-F foundries, as well as supply other companies producing for Willow Run.

Pontiac has boosted capacity of about 500,000 units a year with its recently completed expansion, considerably up from past levels which permitted a volume of 330,016 units during 1941.

Under-Floor, semi-flat engine drives this 5 to 7 ton commercial vehicle produced by Commer Cars Ltd., Luton, England. The six-cylinder, overhead valve motor develops slightly over 100 hp. Three may be accommodated comfortably and the floor area is completely clear. A simple system of temperature control enables the all-steel cab to be cooled or heated according to climate or season

Credits Granted To Concerns in Italy, Austria

Export-Import Bank Lends Industrial Firms Money For Machines, Materials

WASHINGTON — Credits have been extended by the Export-Import Bank of an Italian Government credit institution, the Instituto Mobiliare Italiano. Agreements covering the terms and conditions of individual credits have been executed between this bank and the Italian authorities. No disbursements have yet been made on these credits pending the conclusion of certain formalities and arrangements between the Italian Government and the beneficiary companies. Credits mounting to $22 million have also been allocated to an unspecified number of small Italian industrial firms. The bank does not have the names of the beneficiary firms under this allocation.

Of the Italian firms, Fiat Automobile Company obtained $10 million for expansion and improvements. Around $15 million has been allocated to steel mills. Increased steel expansion and production will in turn help all other mechanical industry. These credits will go a long way toward the rehabilitation of Italian industry.

Austria

On July 31, 1947, the Export-Import Bank extended credits aggregating $13,005,000 to two Austrian banks, the Creditanstalt-Bankverein and the Laenderbank. This credit was to assist in financing the acquisition by certain Austrian firms of U.S. raw materials and capital goods. Agreements covering the terms and conditions of the credits have been executed between the Export-Import Bank and the foremention ed Austrian banks. No disbursements have as yet been made, pending the receipt of certain technical information required from the Austrian authorities.

Included in the foremention ed $13,005,000 credit, of which the allocations listed here are a part, is a further sum of $4,445,000 which is allocated to Austrian chemical firms and industrial consumers of finished dyes and lubricants. The bank does not have the names of the beneficiary firms under this latter allocation.

Italy

Name	Amount	Purpose of Materials & Equipment Type
Fiat	$10,000,000	Automotive ifidustry
Pirelli	4,000,000	Tire and rubber industry
Montecatini	9,000,000	Chemical industry
Ansaldo, S.p.A.	3,000,000	Shipyards
Odero-Terni-Orlando, S.p.A.	800,000	Shipyards
Cantieri Riuniti, S.p.A.	1,500,000	Shipyards
Navalmeccanica, S.p.A.	500,000	Shipyards
Ilva, Alti Forni e Acciaierie d'Italia, S.p.A.	7,500,000	Steel mills
"Terni" S.p., l'Industria e L'Elettricita	3,000,000	Steel mills
Delmine, S.p.A.	1,000,000	Steel mills
Societa Italiana Acciaierie Cornigliano	1,000,000	Steel mills
Acciaierie e Ferriere Lombarde Falck, S.p.A.	2,000,000	Steel mills
Chemical Firms (9)	3,210,000	Chemical industry
Rubber Firms (5)	1,410,000	Medium rubber industry
Electro-Mechanical Firms:	8,030,000	Medium electro-mechanical industry
Ducata Soc. So. Radio Brevetti Ducati-S.p.A.—Milano		
Compagnia Generale d'Electricita—Milano		
Fabbrica It. Magneti Marelli S.p.A.—Milano		
Soc. An. Fabbr. Aparecchi Radiof—Milano		
Ercole Marelli S.p.A.—Milano		
Autelso Mediterranea SATAPSA—Milano		
Magrini S.A.—Bergamo		
S.A. Microtecnica—Torino		
Ind. Naz. Cavi Elettrici—Torino		
CEAT S.p.A.—Roma		
Ind. Condutt. Elettr. Fiorentina S.p.A.—Sesto Fiorentino		
SICE—Conduttori Elettrici S.p.A.—Livorno		
Fabbr. It. Condutt. Elettrici S.p.A.—Napoli		
Fengaro Conduttori Elettrici S.p.A.—Milano		
Metallurgical, Mechanical Firms:	$19,350,000	Medium metallurgical industry
La Magona d'Italia S.p.A.—Firenze		
Nazionale "Cogne" S.p.A.—Torino		
Societa Italiana Ernesto Bredo—Milano		
S.A.V.A. Soc. Alluminio Veneto Anonima—Venezia		
A Tonolli & Co.—Milano		
Lancia S.p.A.—Torino		
Alfa-Romeo S.p.A.—Milano		
Fabbrica Automobili Isotta Fraschini S.p.A.—Milano		
O.M., S.p.A.—Brescia		
Aeronautica Macchi, S.p.A.—Milano		
Soc. Naz. Officine di Savigliano—Torino		
S.A.B.I.E.M.—S.A. Bolognese Ind. Elettro Meccaniche e Fonderie Parenti-Bologna		
OTIS, Ascensori e Montacarichi Soc. An. It.—Napoli		
Lombardini, Fabbrica Italiana Motori S.p.A.—Reggio Em.		
Soc. Galileo S.A.—Firenze		
Ing. C. Olivetti & C., S.p.A.—Ivrea		
San Giorgio, S.I.p.A., Genova—Sestri		
Nebiolo S.p.A.—Torino		
Fabbrica It. Lime di Precisione, F.I.L.P.—Torino		
Filli Borletti S.p.A.—Milano		
Caproni Elettr, Saronno S.A. (CEMSA)—Milano		
"Reggiane" Off. Mecc. Ital. S.A.—Reggio Emilia		
Filli Marzoli & C.—Palazzolo sull 'Oglio		
RIV-Officine di villar perosa—Torino		
S.p.A. Piaggio & C.—Genova		
Innocenti—Soc. Gen. Ind. Metallurgica e Meccanica S.p.A.—Roma		
Cantieri del Tirreno—Genova		
Cantiere Navale Breda S.p.A.—Venezia		
Officine del Moncenisio—Torino		
Franco Tosi S.p.A.—Milano		
Cantiere Navale Riuniti—Genova		
Compagnia Italiana Westinghouse—Torino		

Austria

NAME	AMOUNT	PURPOSE
Gebrueder Boehler & Co., A. G.	$1,600,000	Ferro-Alloys for high grade steel makers
Schoeller-Bleckmann Stahlwerke, A. G.	800,000	
Graef and Staft Automobil Fabrik	380,000	Materials and machine tools for diesel engine manufacture
Vereignigte Aluminumwerke Ranshofen	1,400,000	Rolling mills and extrusion presses for aluminum industry
Steyr-Daimler-Puch	2,700,000	Materials for manufacture of automotive equipment, cars, trucks
Simmering-Graz-Pauker	250,000	Machine tools for production of automotive equipment
Elin, Aktiengesellschaft fuer elektrische Industrie	1,630,000	Materials and machinery manufacture electrical manufactures

Temporary Clearance Is Given Oil Firms to Unite to Meet Shortage

WASHINGTON—The oil industry has received temporary—but only temporary—clearance from the Justice Dept. to get together on moves to ease the fuel oil shortage in the Eastern and Central states. The attorney-general ventured no ruling as to whether joint action to meet the shortage would be legal under the Taft voluntary-agreements law. In fact, he rather indicated they wouldn't.

But Clark promised that joint measures taken during the next two months will not be used as a basis for anti-trust prosecution.

Clark's ruling has the effect of legitimizing a number of industry moves in the way of product pooling, taken with some misgivings, under local pressure. And for fuel oil consumers, it should mean some increase in supply plus a general smoothing out of the situation between critical and comfortable areas.

Shift in Operations

Most significant of the expedients opened up by the Justice Dept. is a general shift in refinery operations to maximize fuel oil production at the expense of gasoline. This will mean passing up the normal off-season accumulation of gasoline stocks. It was already touch and go whether next summer's gasoline demand could be met, but this makes a squeeze nearly inevitable.

Most of the industry has felt the need for such refining policy; although petroleum demand generally has been increasing past all expectation, the rise has been especially marked in fuel. The number of gasoline burners—cars, trucks, tractors—was about 6% higher in 1947 than in 1946. But the one-year increase in fuel-oil users was simply fantastic—40% for space heaters, 20% for oil burners, 26% for diesel locomotives.

Nevertheless, individual companies have been fearful about shifting operations on their own for fear that competitors who didn't shift would grab a bigger share of the valuable gasoline business.

By simply agreeing to look the other way while the oil industry deals with the shortage, Attorney General Clark has ducked a decision on the whole future of the voluntary-agreements program.

The administration has interpreted the GOP's law as permitting economic planning which would be primarily governmental, which would lack only mandatory force to be just like wartime WPB procedure. Government officials are anxious to avoid the rise of any NRA-type industrial self-regulation — even though many of the Republican legislators who put through the bill had just such an approach in mind.

Regulations just issued by the Commerce Dept. governing voluntary agreements make this clear. Plans are to be formulated by government people, assisted by industry committees whose functions are limited to advice and furnishing information. The committees, whose members are to be selected by government, are to have no power to set policy for their industries.

Plans arrived at are to be made the subject of public hearings and are to be submitted to Justice for approval.

Once approved, the plans will be administered, not by the industry itself, but by government; each concern participating in a plan will get its instructions direct from Washington.

Recommendations

The oil industry's National Petroleum Council brought this whole philosophy into question when it submitted its proposals for action under the Taft law. The NPC plan laid out a number of broadly phrased recommendations. The most important:

1. Maximum output from refineries, even at the expense of crude inventories.

2. Maximum output of fuel oil at the expense of gasoline.

3. Use of tank trucks for short hauls to free cars for long hauls; 7-day week on loading and unloading.

4. Interchange of products among companies. (Absence of provision for interchange of crude is disappointing to some non-integrated firms.)

5. Equitable distribution among users and distribution channels with hardship cases handled by local committees.

6. Check growth of demand.

Administration of this program would be put in the hands of local industry committees who could be appointed either by Interior Secretary Krug or by NPC. The committees would be free to "take concerted action as may be deemed necessary to carry out the recommendations . . . without resubmission of the program for that particular community to the Attorney General for approval."

This open-ended proposal put Clark on the spot. It didn't jibe at all with administration ideas. If he approved it, he feared a rush of similar schemes from other industries who'd been cool to the administration approach. On the other hand, if he turned it down he'd subject himself to the wrath of fuel-short consumers and to Republican charges that he was sabotaging the Taft law.

Welded Steel, with a a 7½-hp. engine, this tractor is manufactured by National Iron Works, San Diego, for the Lincoln Tractor Co. It is equipped with rubber tires, friction clutch and weighs only 885 lb.

Disposal Policy Changed by WAA On Freed Tools

CHICAGO—The Machinery Dealers' National Association has informed its members of changes in WAA policy for disposal of surplus machine tools and equipment released by JANMAT.

After the JANMAT program is completed it is roughly estimated that there will be less than 50,000 tools; many will be special and limited-purpose tools. As these tools are made available to the public, they will be offered to the various priority groups which will maintain their priority rights to the end of the program, which will be about June, 1948.

The balance will be made available to the dealers, with the exception of a few very expensive special tools which have limited sales potentialities and for which request to purchase has been made direct by the few companies who can use these tools. On these tools WAA has ruled no discount will be allowed the dealers.

All other machine tools will continue to be sold to the dealers at the usual 17½% discount. In those cases where warehouses and plants will be liquidated quickly because of dateline necessity, WAA has promised to send the Association notices of such liquidations so that they may be placed in the regular bulletins for the general information of members.

Meanwhile, WAA reports their inquiries are increasing at the present time.

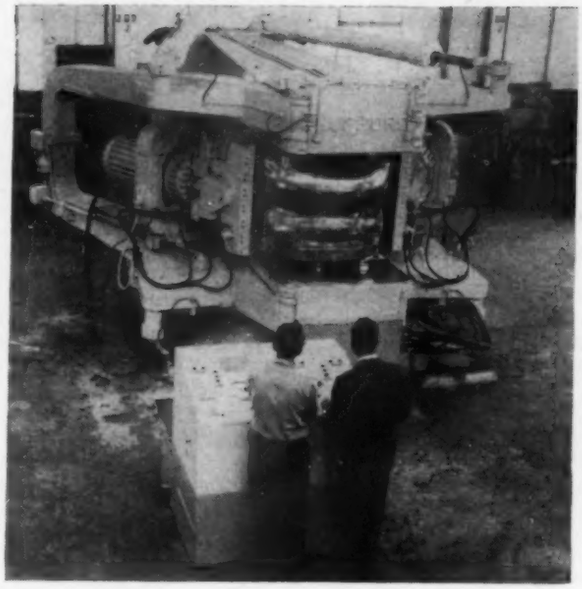
Body Engineers Name Haberstump

DETROIT — Alfred H. Haberstump was elected president of the American Society of Body Engineers at a recent meeting in the Rackham Educational Memorial Building here.

Other officers named are: vice president, Arthur L. Bradley; secretary, Albert W. Arndt; treasurer, William K. Norwick; trustees, Carl W. Cenzer, Edgard C. DeSmet, Otto F. Graebner, August Keller and Charles Walker.

R. H. McGrath Named

CLEVELAND—Robert H. McGrath, formerly general manager of the Joseph Dyson & Son, Inc., flat die forging company and for a number of years a member of the sales department of the Canton Malleable Co., has assumed his duties as assistant to Tell Berna, general manager of the National Tool Builders Association.



Stretch-Form Operations are completed at North American Aviation, Los Angeles, on a Hufford machine. The jaws are capable of exerting a 50-ton pull each. The machine is adaptable to many jobs previously done by drop-hammers and other stretching and forming machines. This new process results in an even stretching of the sheet stock, thus providing a formed part with more uniform strength than could be obtained previously

Tariff Cuts Urged by F. H. Chapin

CLEVELAND — Denouncing high-tariff thinking, F. H. Chapin, president, National Acme Co., called for the establishment of a permanent United States international trade commission in a recent speech.

Full powers, comparable to those vested in the Interstate Commerce Commission, and free of any political influences are necessary for such an organization, Mr. Chapin asserted.

Modification or even suspension of our trade barriers to permit needy countries to gain dollars, which in turn they would use to buy our goods, was seen by Mr. Chapin as partially reducing the amount of aid which this country intends to ship throughout the world.

"What I have endeavored to make clear is my belief in, and recommendation for, a drastic reformation in our whole export-import business. Of a realistic attitude toward the undeniable fact that only by buying goods can we sell goods. To the extent that we increase our imports can we successfully increase our exports," Mr. Chapin continued. "That to administer this vast enterprise there should be set up a permanent, authoritative and non-political tribunal to deal with all aspects of our international commerce without interference from selfish pressure groups; a tribunal whose authority and duty it would be to establish, amend and enforce all customs rates; to supervise matters pertaining to exports; to explore and encourage new ways of increasing our international trade; to make bilateral agreements with other countries; and to do all things necessary to promote through international trade the economic interests of the United States for all the people of the United States, indiscriminately."

Mr. Chapin also denounced the "red tape" which importers in this country are subjected to and called for a simplification program which would speed materially the handling of exports and imports.

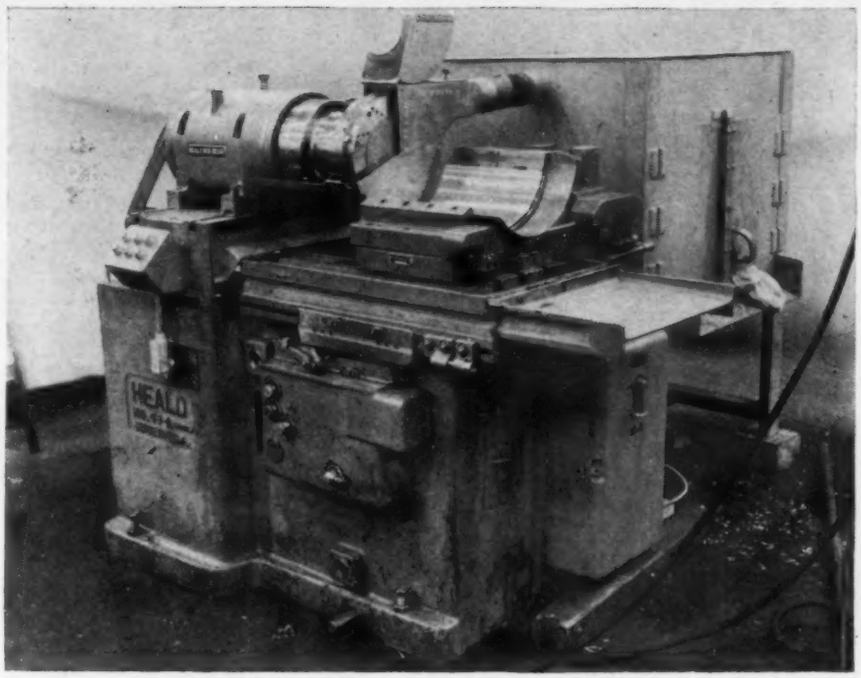
Steel for Small Plants Sought

WASHINGTON — As much protection as possible for the smaller manufacturers on their steel supply was called for by W. R. White, Jr., president of the National Tool and Die Manufacturers Association, as the board met with ranking officials of the Department of Commerce.

Breaking away from precedent, the directors met here rather than in some tool center in order to discuss problems of the industry with administration officials and members of Congress.

Small businessmen were urged to submerge their strong individualism in favor of cooperation in working for what business needs so that it may thrive. J. L. Kelly, director of the Office of Small Business, explained that the Department of Commerce is seeking to develop an atmosphere in which small business can grow and expand. He pointed out that 45% of all jobs and 35% of the total output come from plants employing 50 or less.

At the directors meeting reports from some centers regarding the business outlook were quite encouraging and from others only fair. Stamping dies and special machinery are the types of special tooling most in demand. Little change in employment in the tools shops was reported. The next meeting of the NTDMA Board will be at the Lincoln Hotel, Indianapolis, May 21-22.



Blower Removes Chips—Six tons of chips a day are removed by a blower on this Heald 47-A Bore-Matic used by a printer. Curved printing-press plates, cast ½ in. thick to eliminate porosity in the lead alloy, are bored ¼ in. on the radius to close tolerances. Five bits, set 0.050 in. undersize and in the same plane, do the roughing. A sixth bit behind them semi-finishes the bore, which is later shaved 0.02 in. to size. Parts are held in a hydraulically clamped cradle fixture; chips from the collector-guard are sucked into a hopper at rear; the cycle is automatic

Sales Engineering Courses to Open July 12 at Cornell for Machine Men

ITHACA, N. Y.—Designed especially for the machine tool industry, the first special summer refresher course in sales engineering will be held July 12-23 at Cornell University under the joint sponsorship of the National Machine Tool Builders' Association, American Machine Tool Distributors' Association and the University.

This is believed to be the first course in an American university formulated to provide adequate instruction in the selling of capital goods. Many other courses in salesmanship have been available, but they have dealt largely with consumer goods.

Classes Limited to 50

The class will be limited to 50 men, nominated by the members of the two trade associations. The faculty will be under the direction of Prof. Harry J. Loberg, Department of Industrial Engineering Administration, Sibley School of Mechanical Engineering, Cornell. It will include members of the Cornell faculty; sales executives of machine tool builders and distributors; and customers with long experience in buying machine tools. It will number 24.

The course will include lectures, discussions, demonstrations and written assignments, with classes daily from 9 a.m. until 3:30 p.m., five days a week. The students in this course will be housed in fraternity houses on the campus and will be sales managers, direct managers and sales engineers of builder and distributor organizations. There will be no academic entrance requirements.

Never before have the eyes of factory management been so closely focused on cost-reducing equipment, and the industry feels that it is entering a period of greatest opportunity for its sales engineers.

Besides training its sales engineers, the industry is attempting to have the U. S. Treasury Department reverse itself on an average 20.47-year period of depreciation. Machine tool builders insist that a machine tool is obsolete the minute a new one which does the job more economically reaches the market.

According to industry statistics, this means that about every seven or eight years a machine has passed the peak of production performance and is no longer an economical unit. In fact, many users of machine tools expect a new machine to pay for itself in two to three years.

The course at Cornell will include in its curriculum the fundamentals of machine tool selling, including methods of market research, computation of machine earnings, tooling up a job, work simplification, motion economy, the technique of interview and sales presentations, and the written presentation of sales and engineering information.

Committees in Charge

The committee in charge of the course are the Sales and Service Committee of the National Machine Tool Builders' Association: Daniel R. Weedon, chairman, assistant manager, Blanchard Machine Co., Cambridge, Mass.; Reed M. Andress, executive vice president, Barnes Drill Co., Rockford, Ill.; James C. Hebert, general sales manager, Jones & Lamson Machine Co., Springfield, Vt.; J. Herbert Myers, vice president, Lodge & Shipley Co., Cincinnati, Ohio; B. C. Saunders, secretary, Gallmeyer & Livingston Co., Grand Rapids, Mich.; Herbert L. Tigges, vice president, Baker Bros., Toledo, Ohio. Also the Sales and Service Committee of the American Machine Tool Distributors' Association: R. L. Giebel, chairman, Giebel, Inc., New York City; Arthur B. Kettle, vice president, Austin - Hastings Co., Cambridge, Mass.; J. F. Owens, Jr., partner, J. F. Owens Machinery Co., Syracuse, N. Y.; Edward W. Voss, Voss Machinery Co., Pittsburgh, Pa.; George F. Turner, Strong, Carlisle & Hammond Co., Cleveland, Ohio; Frank L. Armstrong, vice president, Marshall-Huschardt Machinery Co., Chicago, Ill.; E. J. Seifreat, president, Seifreat-Elstad Machinery Co., Dayton, Ohio, and H. E. Oatis, Oatis-Booth Machinery Co., Toledo, Ohio.

Army Ordnance Association Changes Name, Broadens Aims

WASHINGTON — Members of the Army Ordnance Association have voted to change the name of the organization to American Ordnance Association. Founded in 1919, the AOA is dedicated to scientific and industrial preparedness. The change in name is in line with the recent broadening of activities to include all phases of ground, sea, and air defense.

Stress Society to Meet

PITTSBURGH — The Society for Experimental Stress Analysis will hold its annual meeting May 27-29 at the Roosevelt Hotel here.

Ralph Flanders

Sen. R. E. Flanders Given High Award

CHICAGO—Translation of our ideas of self-interest into the long-range view is necessary for our survival, Sen. Ralph E. Flanders asserted when he received the Washington Award for 1948 for "high technical skill in perfecting the tools of industry and for distinguished service in the field of human relationships."

Sen. Flanders, former president of Jones & Lamson Machine Co. and the Federal Reserve Bank of Boston, discussed "Technology and Living Standards" at the presentation here Feb. 11. The award is administered by the Western Society of Engineers.

Citing a steadily diminishing supply of natural resources in respect to demands, Sen. Flanders maintained that "the field for the exercise of technology applies as much to agriculture as it does to the metal-working shop."

"We may be assured that the technical response to our new problems will be adequate. The scientist and the engineer have never failed us in the past," he said.

Karl Taylor Compton received the award in 1947 and Vannevar Bush in 1946. Charles Franklin Kettering was honored in 1936.

Chemical Society Will Show Atomic Exhibit At Chicago

CHICAGO—An atomic energy exhibit prepared by the American Chemical Society, dramatizing the potentialities of nuclear power in peace and war, will be displayed at the Chicago Production Show, Stevens Hotel, March 22-24.

Open to the public, the Show will be conducted simultaneously with the Chicago Technical Conference.

Auto Companies Move Ahead On Plane Studies

WASHINGTON—Industrial mobilization studies, on what automobile manufacturers could do to augment airplane engine production in a war emergency have progressed to the second phase. This means that the military and the "know how" soon will be in a position to talk on contracts for a "what-is-needed" study by the industry.

Last April the Air Forces asked the Automobile Manufacturers Association to study ways of shortening the "makeready" should the industry be called upon to produce aircraft and equipment in a future emergency. When advised that this was too broad a request, the air planners asked what could be done by the AMA to augment plane engine production.

The manufacturers then pointed out that in order to come up with any specific information on expandability, and the resources needed to achieve a production goal, they would have to know just what the industry would be called upon to produce for all the services and what priority would be given engine production. This information, or at least a part of it, is being prepared by the Munitions Board and the Air Forces Mobilization Planning sections. It should be ready shortly. When it is delivered, the manufacturers will sign contracts for Phase 2 of resource studies of production expansion.

The resource studies by the manufacturers would concern all facilities needed to turn out aircraft engines. They would cover plant and equipment (including tools), basic and semi-fabricated materials, manpower (both skilled and technical), and other facilities such as power and transportation.

Hypothetical Targets Planned

As a basis for the reports, each plant (or the industry as a whole) would be given hypothetical target production figures. The reports, due in a year, would show what present capacity is and what it could readily be expanded to under the production goal — if the plants were supplied with the necessary resources such as tools, raw materials and manpower.

Actually, the industry has a lot of reference material with which to facilitate its studies. During World War Two the automotive industry, including parts manufacturers, produced 40% of all aircraft engines, 17% of completed aircraft, 6% of aircraft propellers and parts, 32% of aircraft accessories, and 10% of aircraft instruments. The facilities for this production, however, have been absorbed or disposed of.

Phase Two studies similar to those being readied for the auto industry have been underway in the aircraft industry for the past nine months and are scheduled to be completed June 1. Although the studies by the airframe industry cover production of entire airplanes, they are not the problem that the auto studies will be. The airframe people were called upon to study expansion of their specific skill. The auto manufacturers will be asked to develop an additional skill and facility.

The studies by industry all point to one aim by the military — to achieve peak production in one and one-half years after M-Day. That is just one-half as long as it took us at the outset of the last war.

Jack C. Carlton

Jack C. Carlton Succumbs at 67

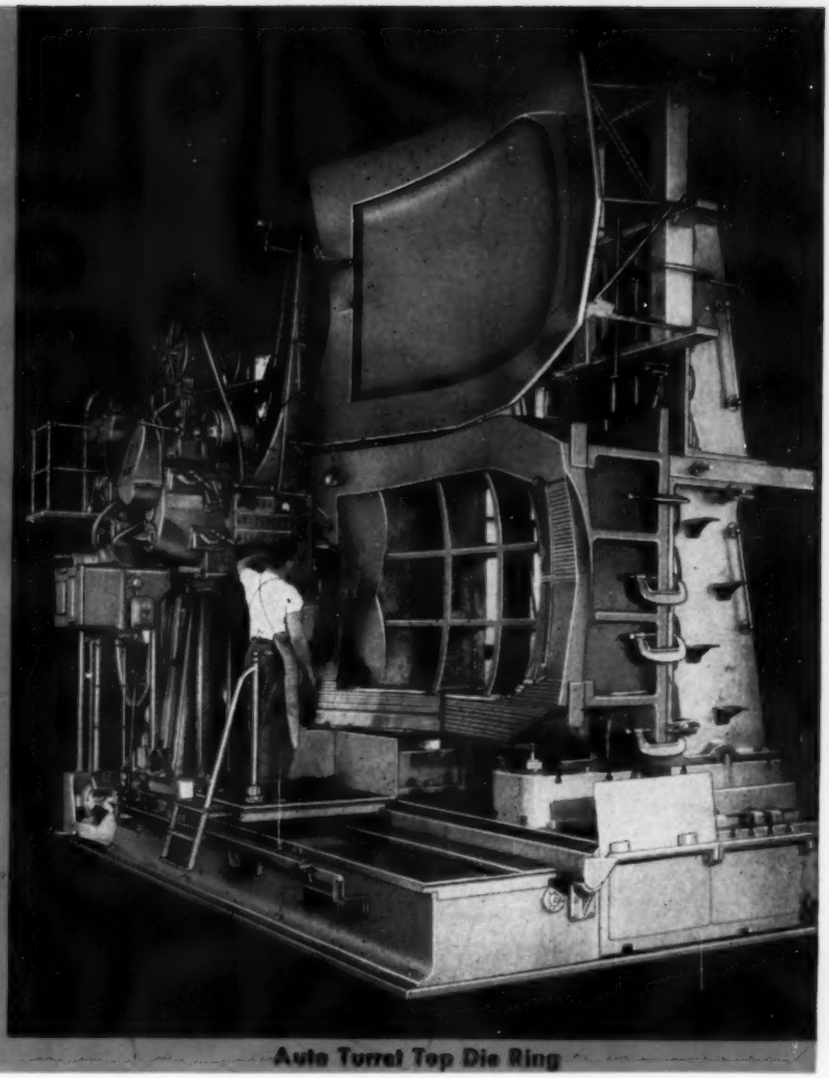
CINCINNATI—Jack C. Carlton, 67, president and general manager of the Carlton Machine Tool Co. and one of the best-known men in the machine tool industry, died Feb. 3 at his home after a four-day illness. He was suffering from a heart ailment.

A native of Cincinnati, Mr. Carlton entered the machine tool business as a youth. Before forming his own company in 1916 with the purchase of the old William E. Gang Co., he was connected with the Bradford, American Tool, Bickford and Lodge & Shipley companies, all of Cincinnati.

While with Lodge & Shipley, he was European representative.

Throughout the machine tool industry, Mr. Carlton was admired and respected.

BIG DIES



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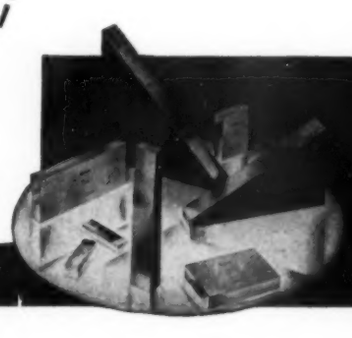

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American Machinist REFERENCE BOOK SHEET

Use of Single-Tool Boring Tools—I

COURTESY GIDDINGS & LEWIS MACHINE TOOL COMPANY

IN BORING operations on horizontal boring machines, the cutting tool is usually mounted in either a bar or some type of cutting head, which in turn is connected to the machine spindle or spindle sleeve.

Boring operations may be classified by considering the number of cutting tools used in the bar or head. One cutter may be used, as in fly-cutting, or several tools to increase total amount of stock removed per bar revolution. More than four tools are seldom used, because of torque and feeding load on the machine.

The use of a single tool is most common because of simplicity and comparative certainty of adjusting the cutter to an accurate setting. This method is best suited to production of highly accurate bores.

Cutter Locking

There are numerous designs for locking the cutter at the desired setting. Representative methods are illustrated.

Wedge Lock—The bar is slotted, Fig. 1, to accommodate a cutter held by steel wedges. Adjustment of the cutter is accomplished by driving the wedges partially tight and then tapping the tool to the desired setting. Accurate adjustments are made by alternately tapping the cutter and the wedges until correct adjustment is reached.

Screw Lock—In this type of cutter lock, Fig. 2, the lock screw is partially tightened and the rear end of the cutter is tapped until correct adjustment is reached. Then, the screw is tightened.

Screw Lock and Screw Adjustment—An adjusting screw behind the cutter, Fig. 3, is preferred by many to tapping the back of the cutter.

Micrometer Adjustment—An adjusting screw with a dial face, Fig. 4, engages threads or serrations on one edge of the cutter. By turning the screw, the cutter is advanced to the desired setting. Then the lock screw is tightened. Accurate adjustments can be obtained, because the dial-faced screw is graduated in divisions representing 0.001 in. (and even 0.0001 in.) for cutter movement in the bar.

Boring Head—A boring head with the cutter supported in an adjustable toolslide, Fig. 5, has the advantage that it may be used over a wider range of diameters than a plain boring bar and cutter assembly shown in previous examples.

Adjustment of Single Tool Cutters

All boring operations must be made so that the finished diameter of the hole is within the specified tolerance. In rough boring, one cut may suffice to open the hole to a diameter within tolerance. But accurate boring requires several successive cuts.

Setting of the cutter for rough boring is comparatively simple. A depth gage can be used, Fig. 6, because the diameter of the bar is known. The cutter adjustment is simply one-half the difference between the diameter of the hole and the bar.

Care in Adjustment

A careful operator will usually take a trial cut, even for rough-bore cutter adjustments. Then, he withdraws the bar and measures across the bore as a check on the accuracy of his calculation and adjustment of the cutter setting. Any allowance for adjustment deviations should be made toward a smaller diameter, because an undersize bore can always be corrected and an oversize one can not be corrected on the machine.

Accurate cutter settings are best made by a readjustment after a trial cut has been made and measured. This procedure will to a large extent eliminate a difference between the measured diameter setting of the cutter and the diameter of the resulting machined bore. For, because of the "built-up" edge on the tip of the cutter (from chip adhesion) and tendency toward bar run-out,

SINGLE-TOOL BORING TOOLS

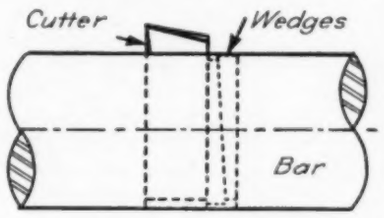


Fig. 1—Cutter locked in bar with steel wedges

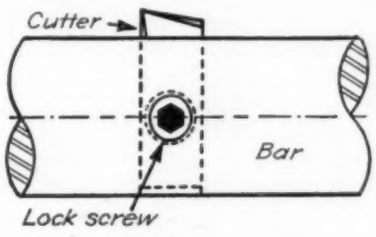


Fig. 2—A hollow-head locking screw provides somewhat easier adjustment ment of the cutter

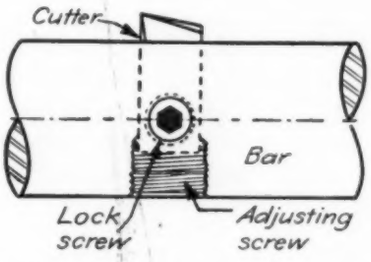


Fig. 3—Movement of the cutter while tightening the locking screw is unlikely if a back-up adjusting screw is used

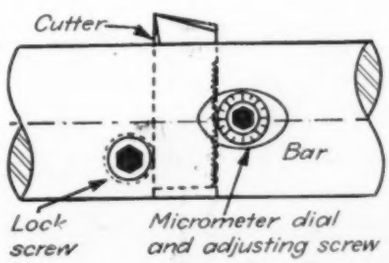
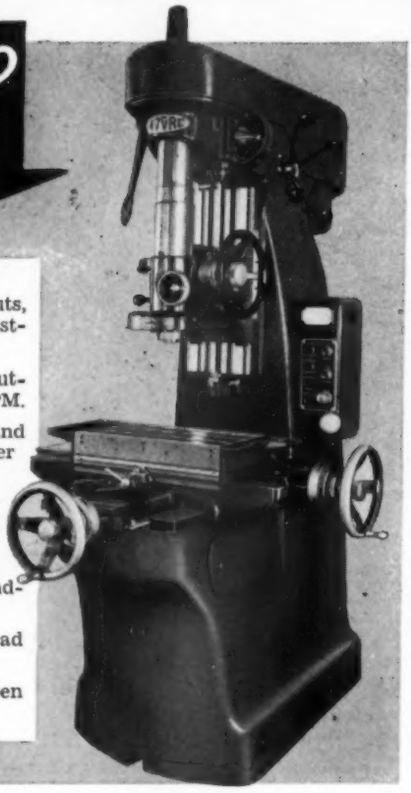


Fig. 4—Micrometer adjustment of the cutter is a feature liked by many operators

Have you seen the new, larger Moore Jig Borer?

WITH ALL THESE ADDED FEATURES



1. Increased capacity and size—heavier cuts, larger holes—up to 5" in mild steel or cast-iron.
2. Infinitely variable spindle speeds, push-button controlled: range from 90 to 2400 RPM.
3. Three power feed ratios, .0015", .003", and .006", per revolution of spindle in either direction.
4. Centralized control panel and tachometer for spindle speeds and 1-shot lubrication.
5. Disconnect clutch for easy indicating.
6. Satin chrome finish on all dials and handwheels eliminates glare and rust.
7. Trip mechanism prevents jamming of lead screw nuts through over-travel.
8. Totally enclosed drive mechanism—no open belts or sheaves.

All the time-proven advantages of the Moore Jig Borer's *accurate lead screw principle* of hole location have been engineered into the new Model No. 2 to meet the popular demand for a similar machine of larger capacity, plus the added features above.

Like its smaller companion model, the No. 2 requires no size blocks or end measures, yet assures consistently accurate table settings within .0001". A turn of the micrometer dials guides the work to precise location rapidly. All holes in the workpiece can be spotted, drilled, bored or reamed consecutively, by coordinate location, and with minimum tool changes.

See what this quick-starting system of hole location means to your operators—how it eliminates the time-consuming methods of stop-and-start to change tools at each hole.

SPECIFICATIONS

Table working surface	10" x 19"
Table travel longitudinal	16½"
Table travel crosswise	10½"
Table top to spindle end	min. 3" max. 18"
Vertical adj. quill housing	10"
Spindle quill travel	5"
Spindle center to column ways	10"
Spindle cen. to col. below ways	11½"

Send for descriptive literature

With the Moore Jig Borer and Jig Grinder, coordinate calculations made by engineering department are used throughout in boring and finish-grinding to figures instead of to "fit."

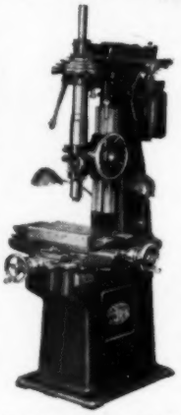
Soft and hardened parts are made concurrently, not progressively. Errors in hardened parts are corrected, not retained and transferred.

Both machines inspect own work without disturbing set-up.

MOORE SPECIAL TOOL CO., Inc.
738 UNION AVENUE, BRIDGEPORT 7, CONN.

SEE THESE MACHINES IN OPERATION AT THE A.S.T.E. SHOW—BOOTH NO. 1401

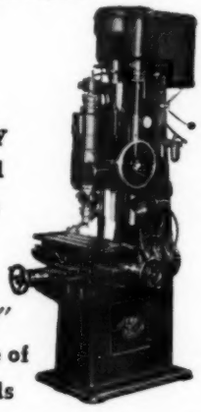
Available Immediately! to promote interchangeability in your toolroom



MOORE NO. 1 Model Jig Borer remains in the line...

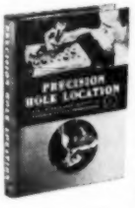
For its range—table working surface of 10" x 16" and cuts up to 3½"—this machine with 1,000 satisfied users is still an ideal buy and will be continued to be offered for the many situations where a small, accurate jig borer fills the required prescription.

MOORE Jig Grinder mechanically relocates and finish-grinds holes in hardened parts to .0001" in ⅓ the time of other methods



The Moore Jig Grinder eliminates hours of checking on the bench and surface plate to correct holes in hardened parts. No toolmaker's buttons or locating plugs are necessary, for this unique machine through the use of *built-in* lead screws *mechanically* relocates and finish-grinds straight or tapered holes in ⅛ to ¼ the time required by conventional methods.

Have you bought your copy of "Precision Hole Location"?



Over 5,000 copies of this valuable book on toolmaking practices have been sold to date. Available at special price of $3 in U.S.A.; $3.50 outside U.S.A. 448 pages, over 400 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.

Add a MOORE to YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS • COMPLETE LINE OF HOLE LOCATION ACCESSORIES

Use of Single-Tool Boring Tools—II

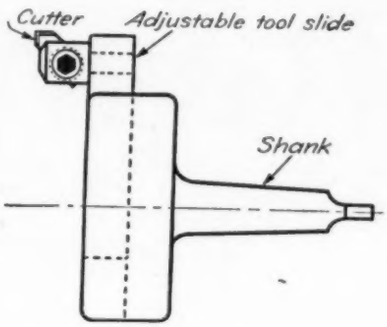


Fig. 5—Boring heads are used when cutter overhang from the bar would be excessive as for large bores

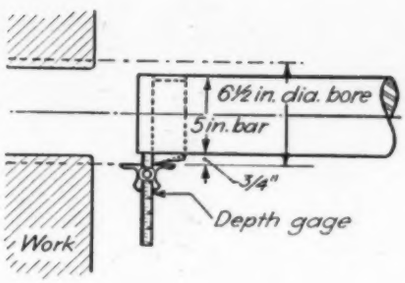


Fig. 6—A depth gage is much used for setting the cutter for desired adjustment, especially for roughing cuts

the cutter is likely to bore a slightly larger hole than the measured setting.

So, after the trial undersize cut is made, the resultant hole is measured with inside micrometers. Next, the cutter setting is measured by one of the methods shown in Fig. 7. The bore measurement may now be used to calculate the new setting of the micrometers to correspond with the correct cutter adjustment.

A pedestal micrometer, Fig. 8, is especially designed for adjusting boring cutters. The device may be used over a wider range of diameters than the usual micrometer and reduces possibility of miscalculation.

Examples of Single Tool Boring

No two operators of horizontal boring machines will use identical procedures to machine the same bore, but there are a number of fundamentals recognized as good practice.

Example No. 1—Straight Bore With Stub Bar

Because of its shape, the piece shown in Fig. 9 can be set close to the machine headstock, thus permitting use of a stub bar. The plus or minus tolerance on the 5-in. hole does not put the job in the high-precision class, and hence two cuts—roughing and finishing—will suffice.

The hole was cored 4½ in. diam., leaving ¼ in. per side for boring. Assume that 0.020 in. per side will be left for finish boring. Hence, the calculation for setting the tool for the rough boring operation is:

Finish diameter	= 5.000 in.
Less finish stock on diam., 2x0.020 =	0.040 in.
Diameter after 1st cut	= 4.960 in.
Less bar diameter	= 4.000 in.
	0.960 in.
Cutter projection	= 0.960÷2
	= 0.480 in.

Set the cutter with a machinist's scale to 15/32 in., or 0.468 + in. This is 0.012 in. smaller than the calculated cutter projection, but it is always safer to stay on the low side for the trial cut.

After a trial cut has been made, withdraw the spindle and check the bore. If no important degree of correction is required for the roughing cut proceed with the operation.

For the finishing cut, the cutter will be set with micrometers, as in Figs. 7 or 8, a trial cut made, the bore checked, and the cutter reset if necessary.

Example No. 2—Counterboring With Stub Bar

This operation is like any other boring operation, except that the cut is made to a definite length. This requires special handling of the spindle traverse (if spindle feed is employed) in order to prevent over-run of the cutter.

Assume a 5 in. bored hole, Fig. 10, is to be counterbored to 5⅜ in. for a depth of 1 in. The cutter is adjusted to the 5⅜ in. setting and a trial cut is taken. If the setting is satisfactory, the cut is continued with power feed for a distance of approximately 15/16 in. The remaining 1/16 in. is machined with manual feed.

Positive means to prevent overrunning the counterbore length are present in horizontal boring machines equipped with turnstile depth

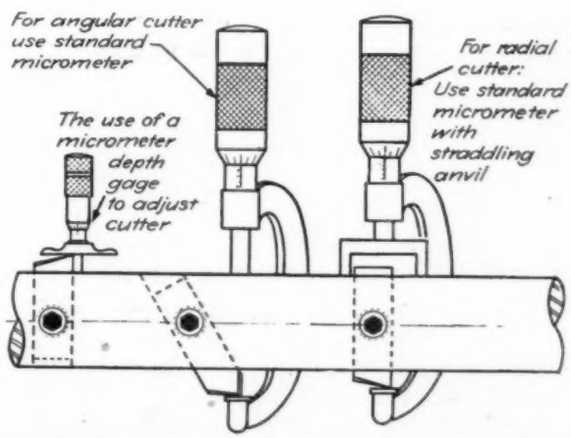

For angular cutter use standard micrometer
The use of a micrometer depth gage to adjust cutter
For radial cutter: Use standard micrometer with straddling anvil

Fig. 7—Micrometers are preferred for accurate settings, especially when finish machining bores to precision limits

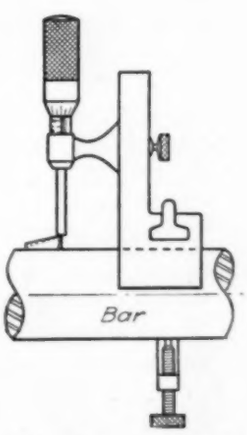


Fig. 8—A pedestal micrometer has a wider range

Cutting Better Threads...Faster

SUNICUT 196...

Speeds Up Threading of Automatic Sprinkler Pipes, Improves Quality of Threads

Here is a case where a big manufacturer of automatic fire-sprinkler systems increased production and improved his threads by replacing a special, expensive oil with Sunicut 196.

Machine: No. 5 Landis Pipe-Threading Machine.
Operation: Threading ⅜" to 8" Pipe. **Lubricant:** Sunicut 196.

In this case, a saving of 15% in oil costs resulted. This is a typical example of how Sun's "Job-Proved" cutting oils have aided in speeding up production and in reducing costs.

Machine-tool operators prefer Sunicut because it is a clear, transparent, free-flowing, sulphurized mineral oil. Sunicut is recommended for those exacting jobs where an emulsifiable cutting oil is not suitable.

Other "Job-Proved" Sunicut grades are suitable for use on automatic lathes, gear-cutters, etc. Contact the nearest Sun office for recommendations.

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Use of Single-Tool Boring Tools—III

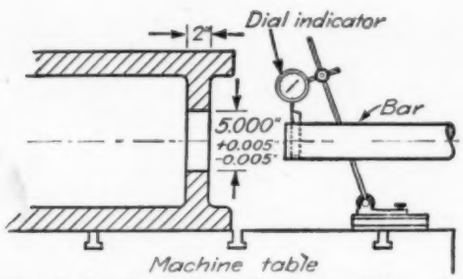


Fig. 9—In Example 1, the bore must be finished to a tolernace of ±0.005 in. Here the dial indicator is a precision reference in making adjustment

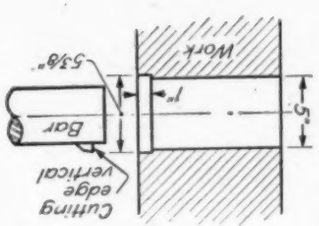


Fig. 10—Counterboring requires care in machining to a specified length as well as diameter but is aided by features of the machine

gage, adjustable dial and spindle feed release. The dial in the above example would be set to 15/16 in when the facing edge of the tool is flush with the outside face of the work. This will cause the spindle power feed to disengage automatically after the cutter has traversed the 15/16 in. length. During manual feeding, the turnstile is rotated just short of the 1-in. graduation and a check measurement is made. A machinist's scale suffices for a wide-toleranced dimension, but for a 0.005-in. tolerance, a micrometer depth gage would be used.

Example No. 3—Recessing With a Boring Head

For this operation, the tooling arrangement must permit lateral feeding of the cutter while the spindle rotates, in order to machine a groove first. Thus a boring head with a cross-slide is required. Fig. 11 shows a boring head with a star feed mechanism, which is operated at each spindle revolution until the cutter is fed to depth—somewhat less than the finished recess diameter.

Longitudinal saddle feed opens the groove for first cut across recess.

Next a groove is machined to the finished diameter of the recess. Longitudinal saddle feed is thrown in to machine across the finished diameter of the recess. Near the end of the recess, the power feed is disengaged and the corner is cleaned out with manual feed. Finally, the cutter is turned around in the toolholder and the opposite corner of the recess is finished.

Example No. 4—Straight Boring With End Support

When the workpiece does not permit setting up close to the headstock, an additional bar support will be needed to avoid deflection. The end support is first aligned with the spindle, and a bar of sufficient length is chosen. Adjustment of the cutter and performing the boring operation follow the principles given with Example 1.

A fixture support for the boring bar can also be used, Fig. 13. By using two cutters, as shown, the length of stroke is reduced, and a close-coupled setup for each cutter is secured in order to prevent inaccuracies from bar deflection. The cutter slot spacing illustrated allows the two bores to be machined independently. In addition, the cutters may be withdrawn from either bore and adjusted from the outside. Machine an extra cutter slot in the bar, if necessary, in order to have the fixture close to the work.

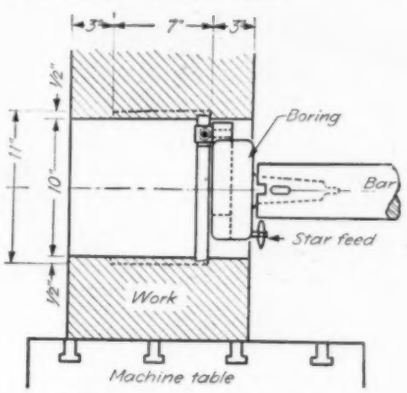


Fig. 11 — For recessing large bores, a boring head with a star feed is essential, and is easily used

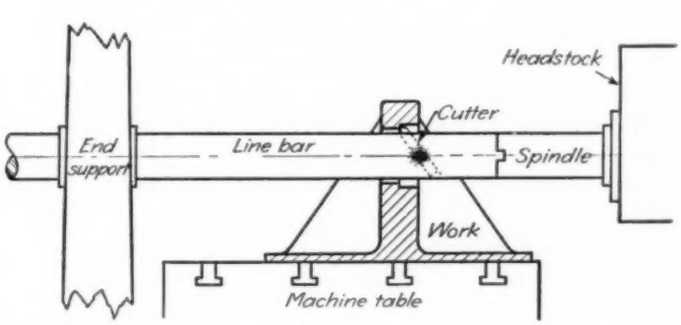


Fig. 12—A line bar and end support are used when the work can not be set up close to the headstock

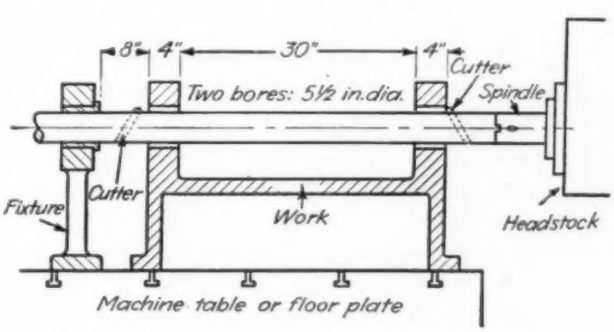
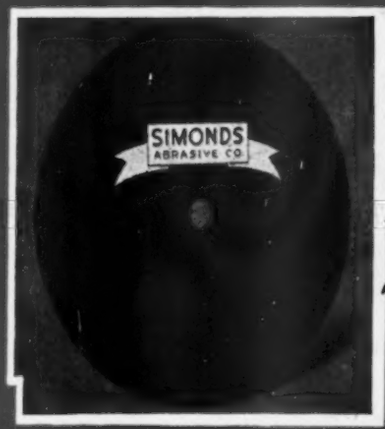


Fig. 13—When two bores are to be machined, a fixture is used to provide bar support close to the outboard hole

the grinding job

Cutting-off 1¼" Hex Hollow Drill Steel to various lengths on a high speed abrasive cut-off machine. This is a continuous production job where fast cutting action and long wheel life are essential.

the wheel



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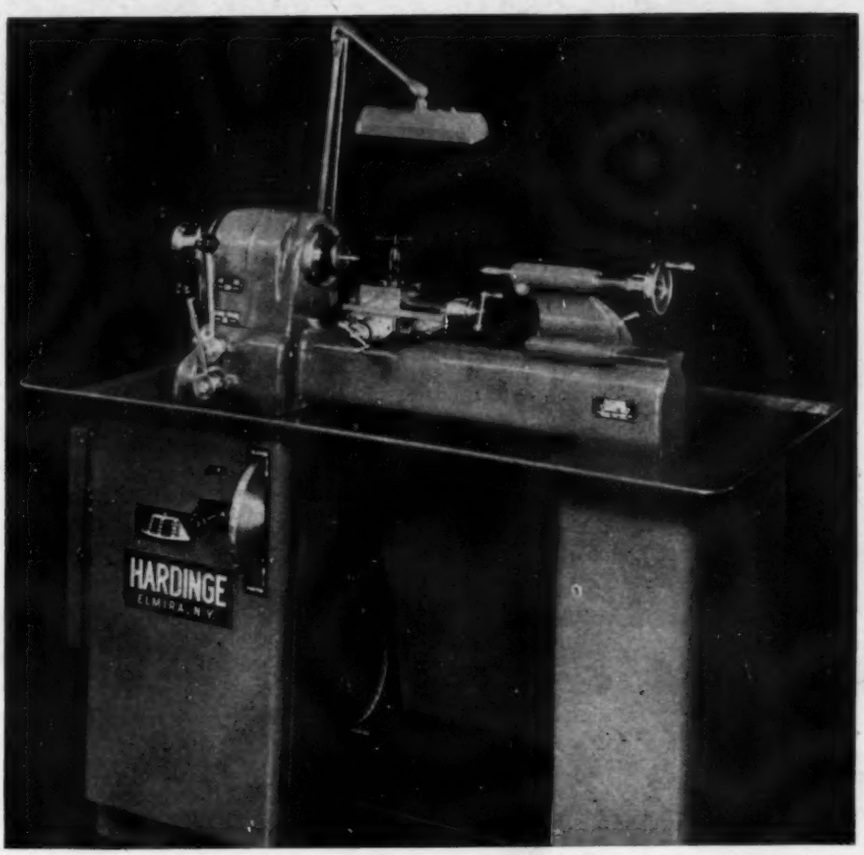
Shop Equipment News



Hardinge High-Speed Precision Lathe Incorporates Variable-Speed Drive

A high-speed precision lathe with variable speed drive and free-spindle clutch is introduced by Hardinge Brothers, Inc., Elmira, N. Y. Designed for working to close tolerances, and finished specifications in toolrooms, laboratories, and development departments, the lathe incorporates hardened and precision-ground steel bed ways in the improved dovetail design. Dovetail ways form a solid bed top. The lathe bed has a three-point mounting on the welded-steel pedestal base which is said to insure original accuracy even when the machine is placed on an uneven floor.

The fully enclosed headstock has a preloaded ball-bearing spindle ground to take 1-in. capacity 5C Hardinge collets, and 6-in. capacity step chucks. The 2-in. dia. feedscrew dials are graduated for direct reading in thousandths of an inch. The ball-thrust tailstock spindle features a constant full bearing in the tailstock body regardless of the position of the tailstock spindle.

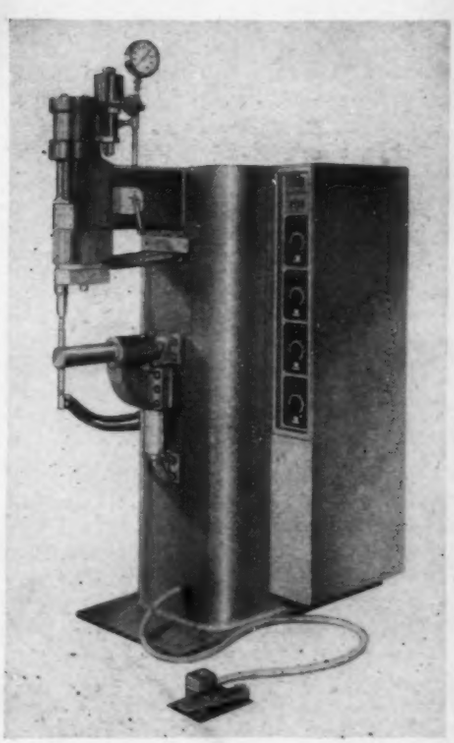
The variable-speed drive affords spindle speeds from 90 to 3500 rpm. A grinder switch controls the motor of the high-speed grinder attachment. All electric controls are housed in one self-contained electrical panel at the left end of the pedestal.

Sciaky Small Spot Welders Afford Three-Phase Control

A series of air-operated press-type welders, available with three-phase control, is introduced by Sciaky Bros., Chicago 38, Ill. Welders offer a choice of five power ratings, 20, 30, 40, 50, and 75 kva., and four throat depths, 12, 18, 24, and 30 in. Capacities on mild steel range from 0.016 to 0.125 in.

The three-phase control feature is said to reduce the required power rating and operate on a balanced three-phase load at a power factor of 85% or better.

Automatic electronic control of the welding sequence is featured. Optional features include a preheat and postheat sequence which allows the welding of scaly and high-carbon steel. Welders up to 24-in. throat depth can be furnished with T-slotted platens for projection welding. A preheat and postheat sequence is available.



Hydraulic Cam-Duplicating Lathe Copies from Revolving Templet

A hydraulic cam-duplicating lathe for reproducing work from a revolving templet by means of a hydraulically controlled cutting tool, is offered by The American Tool Works Co., Cincinnati 2, Ohio. Listed as the 20-in. American Pacemaker lathe, cams are turned from a disk in one cut after which they are ready for the finish grinding operation. The hydraulically controlled cutting tool is said to definitely reproduce the contour of the master. The elimination of spring-action shock is said to insure the maintenance of original alignment for a longer period.

The revolving templet can be either a finished camshaft with integral cams, or a shaft with a series of loose cams. Spur gears relay the drive for the revolving templet from the spindle. Gears synchronize the speed of the templet with that of the spindle.

The support mechanism for the templet is attached to the rear of the bed eliminating loading and unloading interference. Alignment of the templet is accomplished by adjustable steady rests with bronze-tipped jaws which are mounted on the templet-support bar.

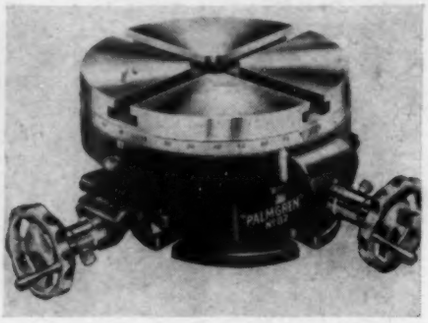
Work is driven by a headstock driver at approximately 20 rpm.

High-Speed Impact Nut Setter Drives at 1750 rpm. Free Speed

An electric torqueless high-speed impact nut setter is introduced by Illinois Gage & Mfg. Corp., 4639 W. Washington Blvd., Chicago 44, Ill. Called the Speed-o-matic, it is said not to twist in the operator's hands when nut becomes tightened. It drives the nut or bolt at 1750 rpm. at free speed. At point of resistance, the unit automatically delivers 3000 impact blows per minute. Reversible for removing bolts or nuts, it is equipped with 25 ft. of cord, and has an overall length of 12½ in. Its capacity is up to ¾-in. bolts and nuts.

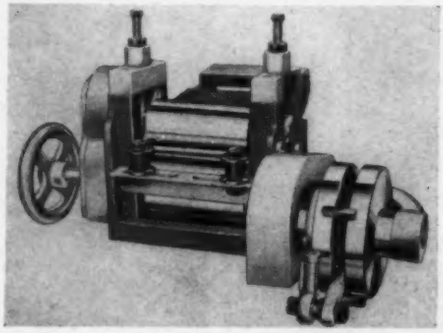
Hobart Electrode No. 111HT Welds in Downhand Positions

An electrode for shielded-arc welding of low-alloy high-tensile steels in the downhand positions, such as deep groove, and positioned and horizontal fillet welds, is announced by Hobart Brothers Co., Hobart Square, Troy, Ohio. Called Hobart No. 111HT, it has a tensile strength of 70,000 to 80,000 psi., a yield point of 65,000 to 70,000 psi., and elongation from 25 to 30%. Electrodes are available in 3/16- and ¼-in. dia., in 18-in. lengths. Current can be either ac. or dc.



Indexing, Cross-Slide Table Graduated for The Full 360°

An indexing and cross-slide table with a graduated rotary top is offered by Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill. Listed as the Palmgren No. 82, the top is graduated for the full 360° and can be rotated manually or locked. The table is 8-in. in diameter and has T-slots for mounting of parts. Cross travel is calibrated accurately in thousandths. Adjustable gibs are provided for take-up due to wear.



FRICTION ROLL FEED, suitable for 4, 6, 8, and 10-ton bench- and pedestal-type high-speed power presses is made by Roll-Feeds Corp., 148 Middle St., Pawtucket, R. I. Unit has four points of contact to safeguard accuracy, is said to maintain original setting regardless of use or wear, and can be used for side or rear feeding. No ratchets or pawls are used

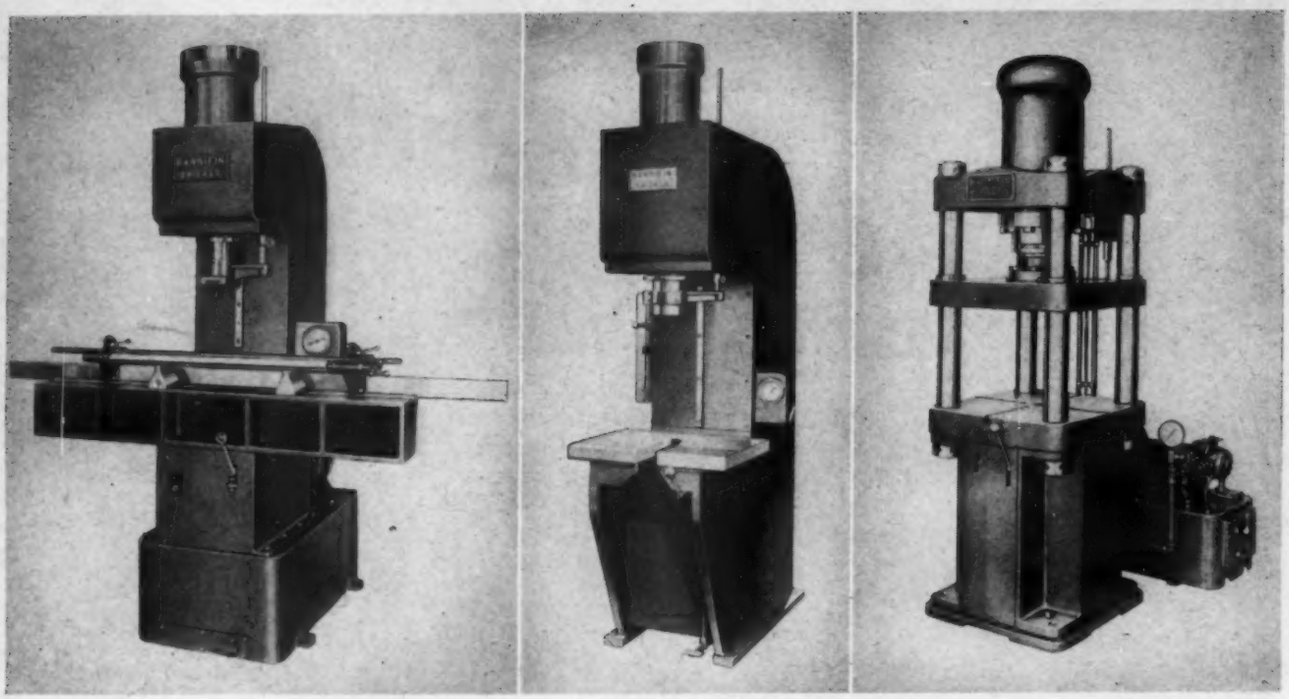
In making flash-welding equipment used in the production of the well known "Taylor Made FLASH ALLOY Sling Chain," The S. G. Taylor Company of Hammond, Indiana, uses the Lodge & Shipley Model A 16" Engine Lathe above.

The operation: end weld bottom trimmer die is being machined from high speed steel. Comparing the production of this lathe with former lathes, the manufacturer states: "Accuracy, very good... time saved, 50%... the Lodge & Shipley Lathe is a very good lathe."

The enthusiasm of this user and many others for their Lodge & Shipley Lathes is more than a coincidence. Actual production and cost figures in plant after plant prove their outstanding record. Write for Condensed Catalog showing the complete line.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO



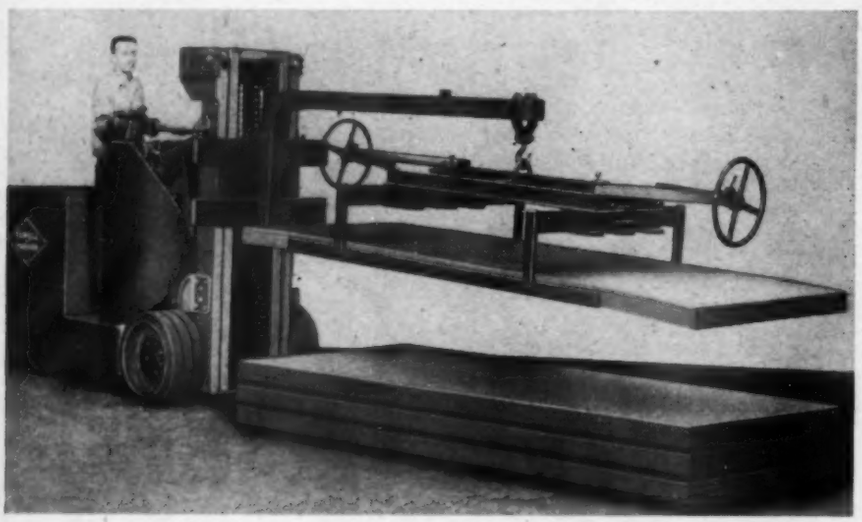
Standardized line includes the Hannifin straightening press, Series S, (left), forcing press, Series F, and column-type press, Series C

Hannifin Line of Hydraulic Presses Offers Sensitive Pressure Control

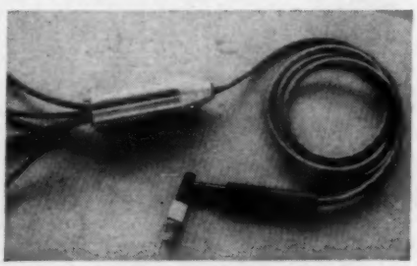
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago 24, Ill., announces a standardized line of hydraulic presses designated as Series S straightening presses, Series F forcing presses and Series C column-type presses.

Series S presses are produced in seventeen different models while Series F open-gap forcing presses are offered in ten models. Both feature Sensitive Pressure Control as standard equipment. This control permits varying the ram pressure in proportion to the pressure on the control lever. It can also be used to apply a uniform repetitive pressure on production work.

Series C four-column presses are built in 48 models providing a choice of 18-, 36, and 60-in. space between columns, left to right, and in capacities ranging from 6 to 150 tons. Controls offered include manual, electric pushbutton, and Sensitive Pressure types.



STEEL PLATE AND SHEET HANDLER utilizing the principle of counter-balancing effect of the truck, has a forward and backward tilt. Made by Elwell-Parker Electric Co., Cleveland, Ohio, the truck is furnished with telescoping uprights so that it can enter a boxcar and yet stack steel 6 to 10 ft. high. The clamp-grab has 24-in. adjustment for widths and is 84 in. long. Truck travels at 400 fpm. and elevates at 12 to 22 fpm.



Airco Manual Heliweld Holder Embodies Water Cooling Feature

A water-cooled manual Heliweld holder for continuous-production work with the inert-gas-shielded arc-welded method, is offered by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. The features include an insulated all-plastic exterior, a gas cap, made of non-conducting material, and a light, flexible cable encased in a translucent plastic cover.

Holder has a current capacity of 300 amp. ac. or dc., and is approximately 10 in. long, weighs about 28 oz., and handles tungsten or carbon electrodes up to 3/16-in. dia.

For Office Furniture IT'S THE "NEW LOOK" and Low Cost Assembly

. . . when AMERICAN PHILLIPS SCREWS Fasten Better, Faster!

PRODUCTION-WISE: Output multiplies when automatically straight driving American Phillips Screws "sing a song" of *steady accelerated* production. Safe to use . . . fumble-proof, slip-proof and damage-proof, they rate high with management and workers, alike. And American Phillips Screws pay off wherever they attack inflated assembly costs, TIME SAVINGS UP TO 50% ARE COMMONPLACE!

PRODUCT-WISE: It's *definitely* the "new look" for office and home furniture, cars (motor and railroad), boats, bicycles, appliances and what not when American Phillips Screws make fastening a *feature* instead of a *function!* Discriminating buyers look for the decorative, straight set, *unburred* heads that mean high style and safety for clothes and investment. To slice *your* costs and spark *your* sales write

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Metal Powder Press by Do-All Co. Applies Top, Bottom, Side Pressure

A 30-60 ton metal powder press, manufactured by Continental Machines, Inc., is offered by DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Press applies pressures from the top and bottom as well as side pressures simultaneously through hydraulic cylinders. Pressure variations on each cylinder are made by adjustment valves operating from a control panel. Cylinders operate by separately driven Vickers, 14-gal., 2000-psi. pumps driven by individual 20-hp. motor at 1200 rpm. Shapes, either solid or core can be handled.

Each set of cylinders can be individually adjusted for rate of travel on both the power stroke and the return stroke. The rate of travel on the power stroke is adjustable from 0 to 100 ipm., and the return stroke from 2 to 200 ipm.

Press is equipped with positive mechanical stops for dimensional control. Relief valves are provided for density control. Unit is automatic for high-production runs.

Also offered is a 100-ton press, having a single-acting top cylinder and two single-acting bottom cylinders. The two bottom cylinders are coupled together to act as one and are so spaced as to permit the use of a stationary core rod.

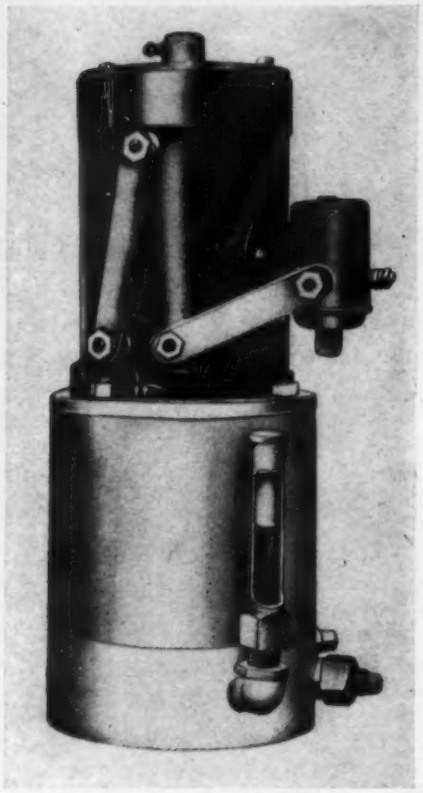
Rapids-Standard Floor-Veyor Jr. For Moving Medium Weight Loads

A standardized multi-purpose power belt conveyor, the Floor-Veyor, Jr., is offered by The Rapids-Standard Co., Inc., Dept. FJ-114, 342 Peoples National Bank Building, Grand Rapids 2, Mich. Designed for moving medium weight loads between floors or horizontally, it is built in lengths which are multiples of 2½ ft. up to 30 ft.

Self-supporting feeder sections, are adjustable through a 70° arc.

Injection Pressure Multiplier Increases the Ending Pressure

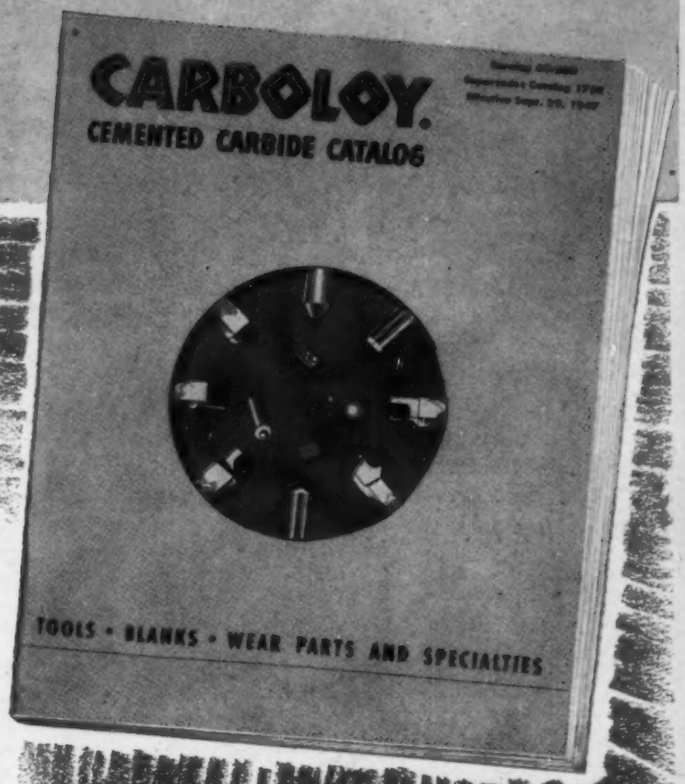
An injection pressure multiplier has been developed by Kux Machine Co., 3932 W. Harrison St., Chicago 24, Ill. Machine multiplies the metal injection pressure during the final travel of the plunger's stroke and is said to increase the ending pressure to twice to five times that of the starting pressure. Multiplier is built into the hydraulic injection cylinder, is self contained, and automatic in operation. Either bullet speed or slow metal injection can be used. Machine can be used with any hydraulic die caster.



Jerome's Model 1100 Power Unit Offers Complete Hydraulic System

A fluid power unit, Model No. 1100 Pack O'Power is offered by Jerome Hydraulics Co., 60 Ocean Ave., Lynbrook, N. Y. Unit is adaptable to single cylinder, gravity or spring return applications requiring to 1½ hp. intermittent-duty rating. Except for the ram, unit is a complete hydraulic system including 6- or 12-volt motor, pump, reservoir, circulating oil filter, relief valve, check valve, electrically operated by-pass valve and return-flow regulator for constant rate of ram descent.

Interchangeable pumps are available for pressures to 2000 psi. or flow rates to 4 gpm.



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Over 600 low-cost standard blanks, tools, wear parts and specialties are listed in this newest Carboloy Cemented Carbide Catalog. It contains 64 pages of valuable information on the use of Carboloy Cemented Carbides to cut expenses, up production, improve product quality. Full specifications and suggested uses are given for all standards.

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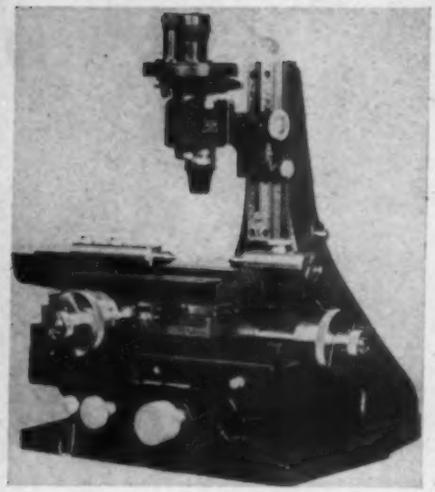
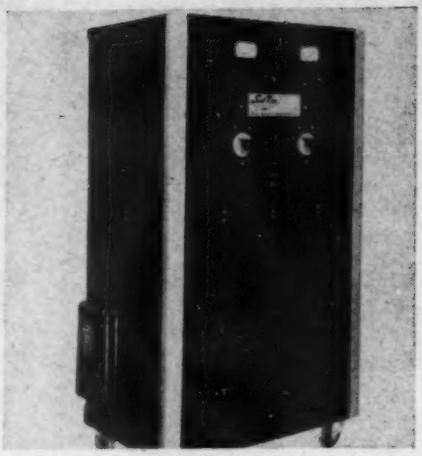


Sagem Toolroom Microscope Features Goniometric Head

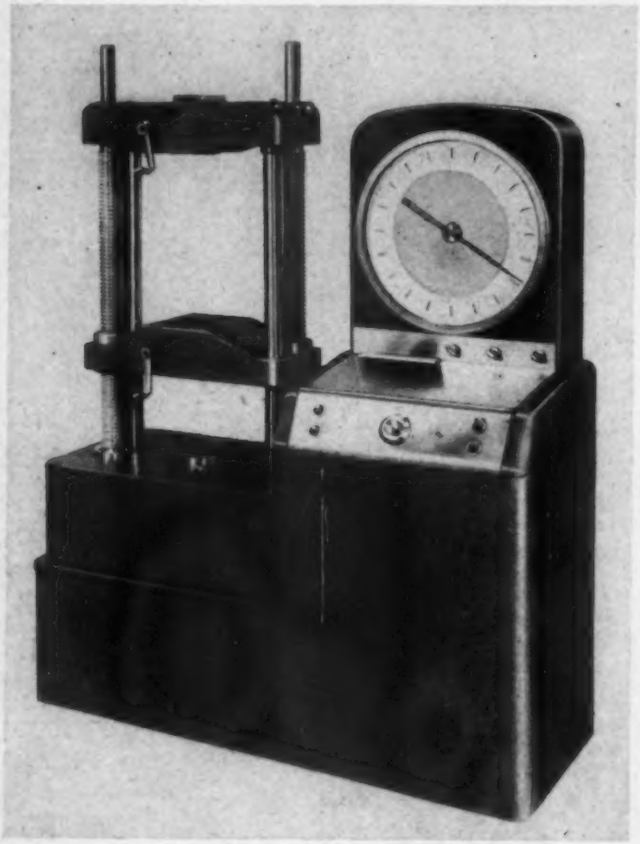
E. Leitz, 304 Hudson St., at Spring St., New York 13, N.Y., announces the Sagem toolroom microscope for control, inspection and checking of profile gages, drill jigs, thread gages, tapes, reamers ,and the other tools in addition to providing a means for making surface inspection.

The table has a longitudinal traverse of 4 in. A pneumatic dampening device prevents damage to the machine should the table be released suddenly. When the table is tilted, constant tension is maintained against a stop by means of a compensating mechanism.

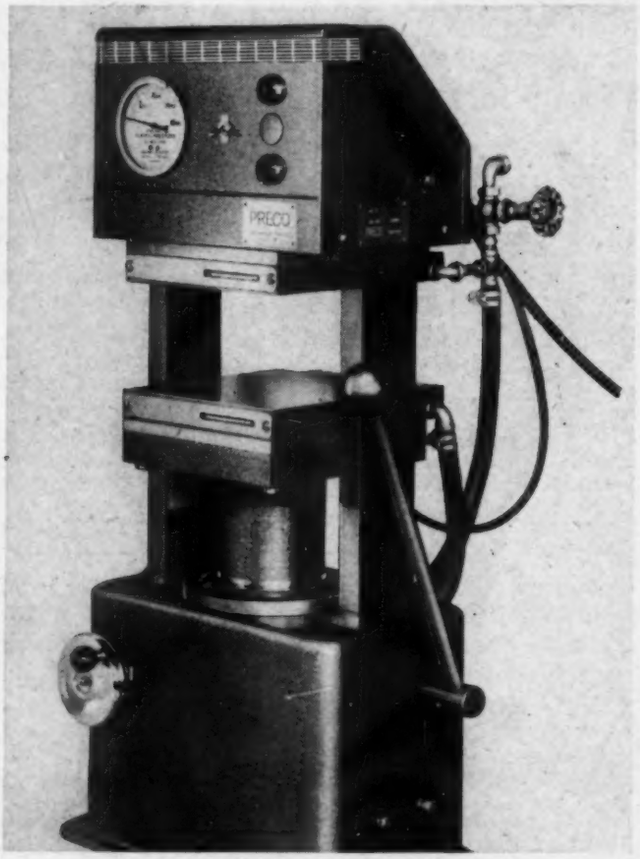
The microscope is normally furnished with a goniometric head, which has a reticule designed to permit making the necessary measurements in the section under observation. Head has a supplementary revolving micrometer permitting the checking of angular measurements throughout the field. Microscope has a magnification of 30, and can be supplied with a revolving plate head, V-blocks and clamps, center points, a double bracket, a drilling head, automatic center punch, and optical knives, as accessories.



SELENIUM RECTIFIER designed to allow a reserve of voltage when plating with diluted solutions of chromic acid or other baths, is made by Bart-Messing Corp., 45 Morgan Ave., Brooklyn, N. Y. The 9-v., 2500-amp. unit is said to have efficiencies over 72% at full load. Elements are said to have over 7700 sq. in. effective rectifying area



HYDRAULIC TESTING MACHINE, PH-60, for tension, compression and transverse tests, has a capacity of 60,000 lb. Made by Riehle Testing Machines, Div., American Machine and Metals, Inc., East Moline, Ill., machine features the loading, pumping, and indicating units enclosed in a single housing. Corrections are made by sliding movable knife edges. Turning of selector knob changes from one range to another. Recorder is built-in under dial on front of machine



BENCH-TYPE hydraulic press, the PA7 Preco, is made by Preco Inc., 1102 Architects Bldg., Los Angeles 13, Calif. Unit is made for operations that require pressure to 20 ton and that may also require heat. Built-in two-stage hand pump incorporates a high-speed stroke for quick platen closure. Electrically heated, water-cooled platens are standard equipment. Platen sizes of 8x8, or 8¾x12 in. are available, and open from 0 to 8 in.

Welded Design Cuts Costs 20%, Improves Saleability

By Louis E. Kibler, Engr.
A. K. Robins & Co., Inc.
Baltimore, Md.

THE urgent need for hard-to-get parts used in the conventional construction of the "goosenecks" for our food conveyors prompted us to redesign them to an all welded steel construction. The new design has netted us savings of 25% in fabricating time and of 20% in material costs. (Fig. 1.) Furthermore, the appearance of the finished machine has been enhanced considerably and the weight reduced 92 pounds, improving its saleability.

The original design of "gooseneck" involved an assembly of three separate parts bolted together. (Fig. 2.) The parts had to be milled, drilled and then tapped. The assembly also required careful matching and fitting of each side frame unit before bolting the parts together.

Our new welded design eliminates the need for any jigs or fixtures. In place of the former "gooseneck" component parts, the new design specifies 3/16" steel plate sheared from stock to any desired angle and size to comprise the side frame sub-unit. The angle iron tracks and guides are welded to the side frame and then notched. The tracks and guides are bent to the required angle to conform with the shape of the steel plate, clamped into position and welded one piece at a time with a Lincoln "Shield-Arc Jr." D.C. welder and "Fleetweld 37" electrode. (Fig. 4.) In the "gooseneck" assembly alone, the weight has been reduced from 67½ to 44½ pounds.

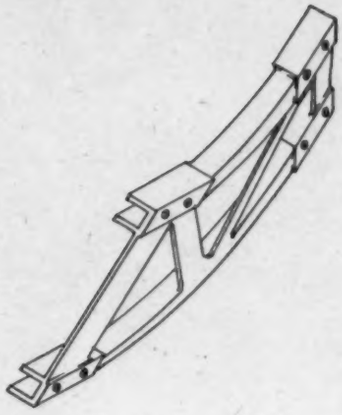


Fig. 2. Original "gooseneck" assembly. Weight 67½ lbs.

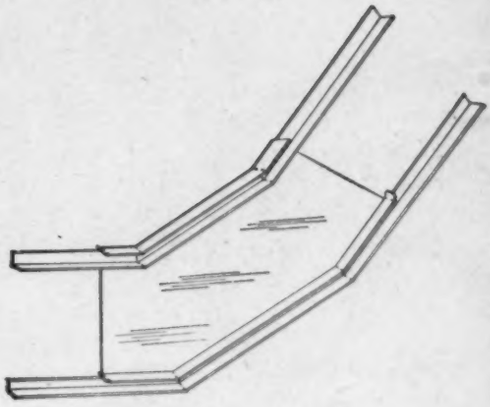


Fig. 3. Redesigned "gooseneck" of arc welded parts. Weight 44½ lbs.

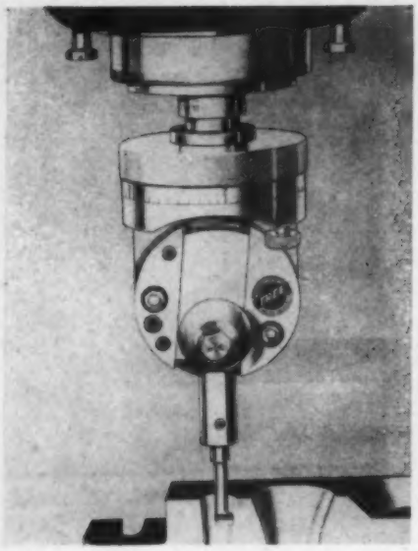
An additional sales advantage of the welded conveyor is the fact that we can now match the customer's needs more readily by supplying any size or angle of "gooseneck." In our previous design little change in detail could be accommodated without involving a prohibitive expense.

To gain the same advantages on other sub-units of our conveyor the tanks, frames, drive pulleys and brackets have also been converted to welded design.

Fig. 1. All welded design food conveyor for the canning industry.

Fig. 4. Arc welding the guides to the side frame plate.

The above is published by LINCOLN ELECTRIC in the interests of progress. Machine Design Studies are available to engineers and designers. Write The Lincoln Electric Company, Dept. 32, Cleveland 1, Ohio.

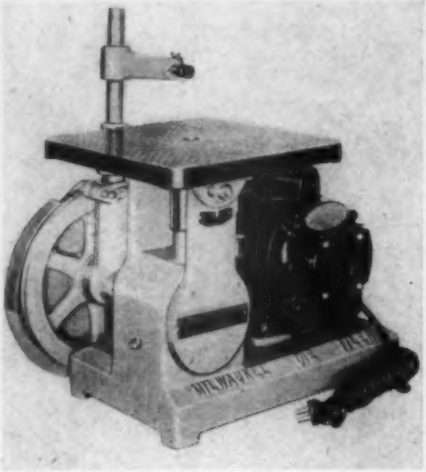


Tree Taper-Boring Tool Fits All Milling Machines

The taper-boring tool is introduced by Tree Tool and Die Works, Racine, Wis. Tool fits all milling machines, jig borers, and boring bars, and is 4 in. in diameter and 5 in. in length.

Straight boring, facing, and outside turning, either straight or taper, can be performed, in addition to taper boring, in one set-up. Work need not be moved as all adjustments are made on the tool.

Tool bores holes to any taper up to 1-in. dia., by setting the graduated swivel base to the desired angle, swinging the boring bar into cutting position, and holding the knurled ring stationary as the tool revolves.



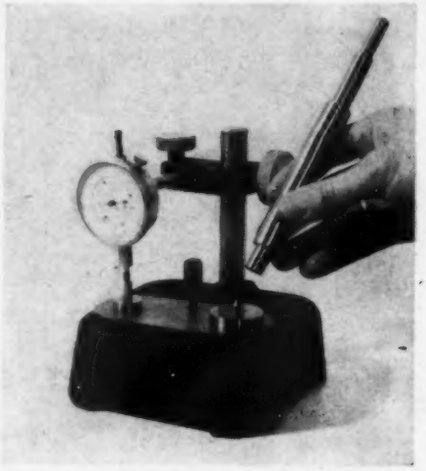
Milwaukee Improved Filing Machine Embodies Serrated Tilting Table

Improvements in the bench-type, reciprocal filing machine are announced by Milwaukee Chaplet & Mfg. Co., 1033 S. 40th St., Milwaukee 4, Wis.

A serrated tilting worktable keeps the work surface free from chips and filings. Table is now equipped with a 4-way tilting mechanism so that it can be tilted to 15° in any direction. A universal-type chuck is featured permitting adjustment to compensate for crooked or warped shanks on files or lapping stones. A safety belt-guard is included as standard equipment.

Portable Belt-Conveyor Booster Offers 36-in. Max. Feed Elevation

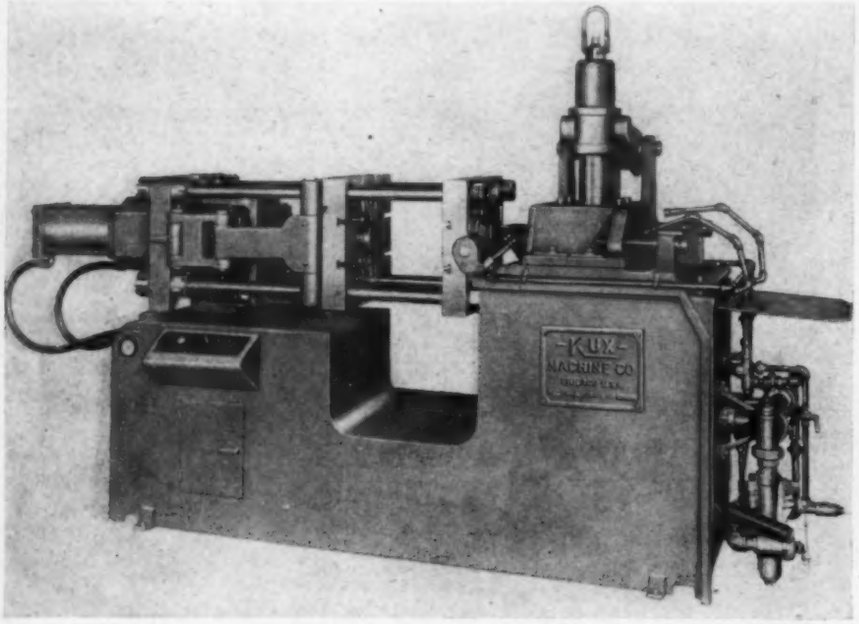
A portable belt-conveyor booster, known as the Styl-O-Veyor, is capable of being fed or discharged from either end. Made by the Island Equipment Corp., 101 Park Ave., New York 17, N. Y., its angle or its height is adjusted by hydraulic power. Width of the unit inset is 16½ and 26½ in. Three-ply rubber-ruff top belt is used. Unit is 20 ft. long, has a vertical adjustment at center of 24 in., a minimum feed elevation of 12 in., a maximum feed elevation of 36 in., and a belt speed of 60 fpm.



Gage For Checking Hole Size Gives Direct Diameter Reading

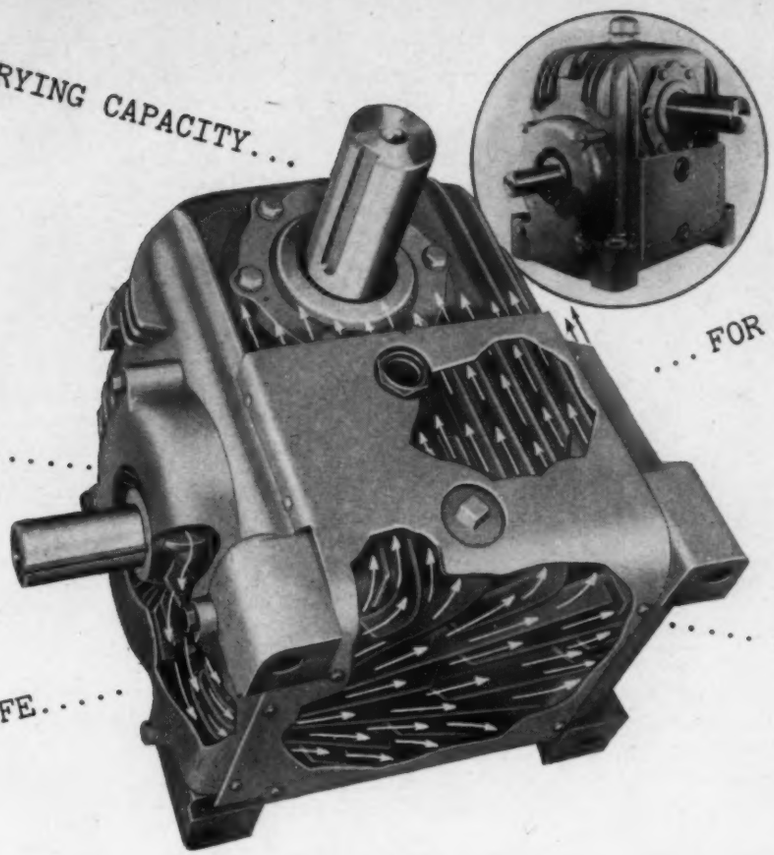
The Center Master gage for checking the size of 60° center holes, is offered by Veteran Machine Works, 511 S. Laflin St., Chicago 7, Ill. Models are available to check the sizes of 90° and 82° countersunk holes.

The gage gives the diameter of the center holes by a direct indicator reading, with no set-up or calculations involved. When the gage pin enters the center hole it travels a certain distance depending on the size of the hole. The indicator is a pre-determined distance farther from the fulcrum of the lever than the gage pin and the travel of the gage pin is translated from a measurement of depth to a measurement of diameter.



PUSH-BUTTON CONTROL accomplishes a complete die casting cycle, with each phase of the cycle electrically timed, on the Model BA-12 air-operated die casting machine made by Kux Machine Co., 3924 W. Harrison St., Chicago 24, Ill. Machine is constructed with die space of 12x12 in. between the bars, and has die plates of 18x18 in. Castings weighing up to 5 lb. in zinc including the gate can be produced

FOR LOAD-CARRYING CAPACITY...



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FOR LOW COST
PER HORSEPOWER.....

.....FOR LOW WEIGHT
PER HORSEPOWER

FOR LONG
TROUBLE-FREE LIFE.....

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CONE-DRIVE FAN-COOLED SPEED REDUCERS

- IDENTICAL THERMAL AND MECHANICAL RATINGS
- STANDARD MODELS FROM 1 TO 130 HP.
- RATIOS FROM 5 TO 70 TO 1
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- COMPACT, RIGID, BUILT FOR LONG LIFE AND HIGHER EFFICIENCY
- CONSERVATIVE MECHANICAL RATINGS

In these new fan-cooled reducers you have the ideal unit for installations where thermal capacity is the limiting factor on load carrying capacity, just as non-fan-cooled Cone-Drives are "tops" where you need mechanical load capacity primarily.

What is more, you do not have to pay for a "special" reducer. Cone-Drive standard pinion-under models 7400 to 7800 inclusive are designed for use either with or without fan-cooling. This standardization and manufacturing economies mean lower cost to the user and simple convertibility.

For complete information, write, wire or call:

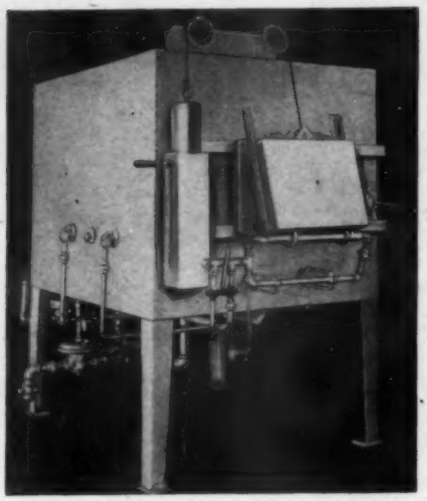
CONE-DRIVE

CONE-DRIVE DIVISION MICHIGAN TOOL COMPANY
7171 E. McNichols Road, Detroit 12, U. S. A.

Three Westinghouse Generators Consolidate Parts into One Unit

Three 20-kw. 450-kc. radio-frequency generators are offered by Westinghouse Electric Corp., Industrial Electronics Div., Plant No. 4, Baltimore, Md. Generator, worktable or sink, current transformers and water fittings are consolidated into one unit requiring minimum floor space.

The three generators are: type A, a single-position unit with built-in worktable and Transite table top especially suited to brazing and soldering; type B, a single-position unit for hardening applications with a built-in work sink, two sets of water fittings and a current transformer; type C, a two-position unit for soldering, brazing, and hardening applications combining a built-in work sink, two sets of coil and quench water fittings, and two current transformers with automatic transfer switch, providing two independently controlled work positions.



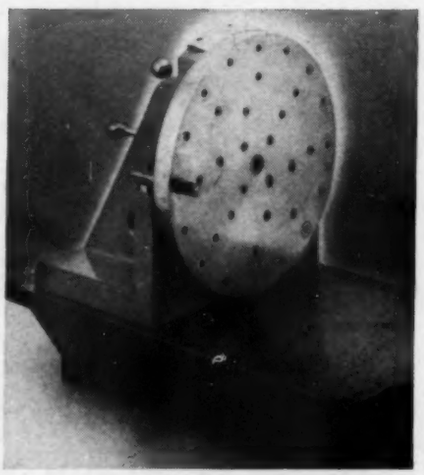
Lithium Atmosphere Batch Furnace Introduces Vapor With Carrier Gas

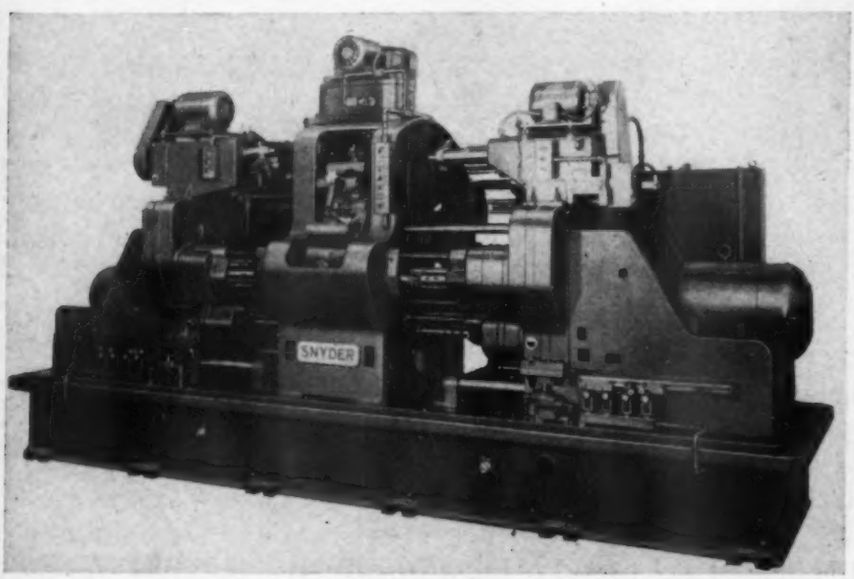
The lithium-atmosphere universal batch furnace, developed for control of heating and atmosphere, is introduced by The Lithium Co., 111 Sylvan Ave., Newark 4, N. J.

With the introduction of lithium vapor, accompanied by the usual carrier gas, into the heating chamber of the furnace, control of the atmosphere is effected at the work. Protection of the lithium vapor is said to extend to the instant of quenching during air cooling, so that there is no oxidation or change in surface analysis of the metal. Treatment is said to leave a clean, scale-free, non-decarburized product.

Furnace has a temperature range from 1200 to 2100 F., and is said to provide uniform heating under predetermined, automatically controlled conditions in neutral annealing, normalizing, hardening, spheroidizing, carburizing, carbon restoration and brazing.

The lithium vaporizer, which is heated separately, is built into the rear of the furnace. For direct quenching without exposure of the work, the furnace is equipped with a self-discharging, flexible alloy belt or automatic dump trays for loading and discharging parts.





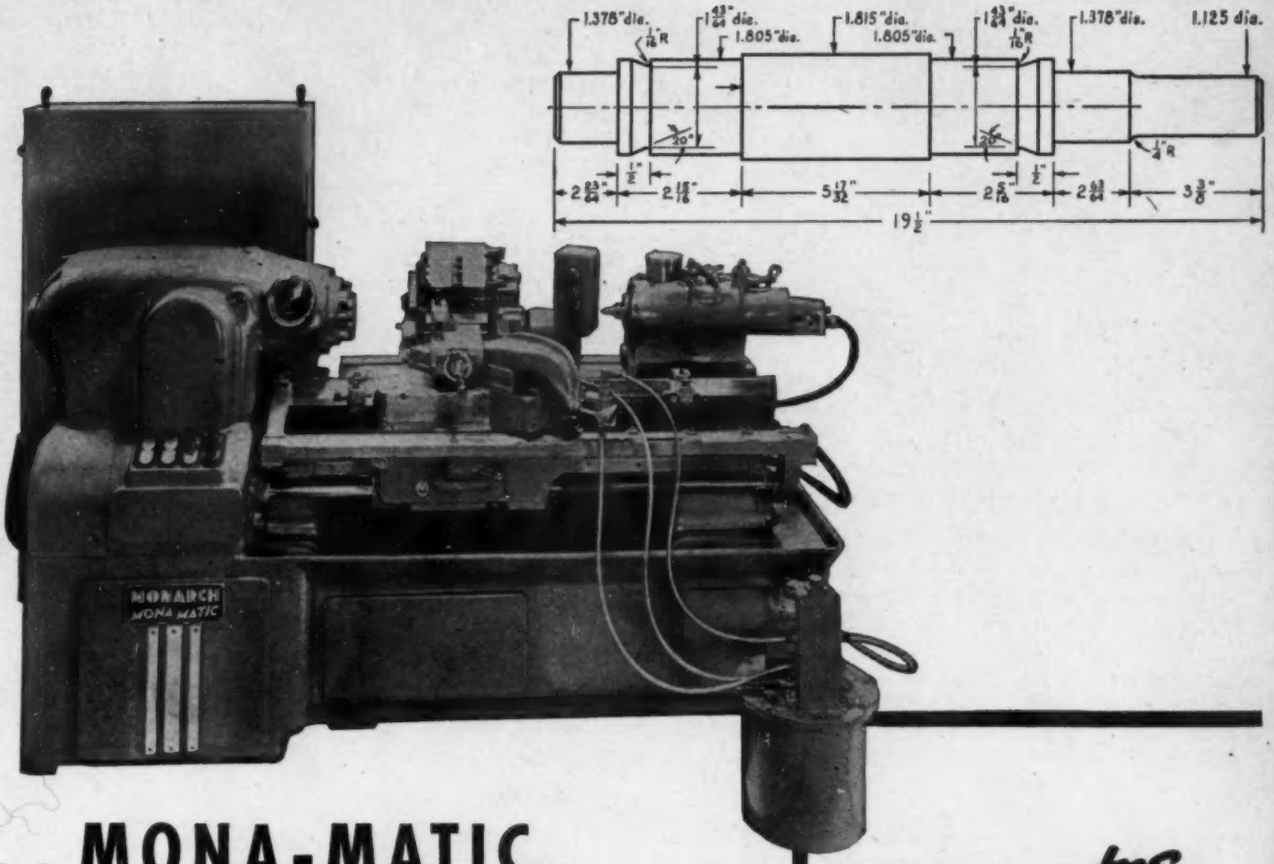
TWO-WAY HYDRAULIC FEED MACHINE automatically drills, reams, countersinks, spotfaces, bores and taps holes in both ends of hydraulic lift cylinder blocks. Made by Snyder Tool & Engineering Co., Detroit, Mich., the machine has eight stations with eight trunnion-mounted work-holding fixtures. Work is clamped manually. Automatic index routes work. Production is said to be forty pieces per hr. at 80% efficiency. Right side of machine has a 37-spindle multiple head and 2-spindle tapping head. Lift has 23-spindle multiple head and a 6-spindle tapping head

Indexmaster Inspection Device Provides Gage-Block Measurement

An inspection device, the Indexmaster, is marketed by The Cleveland Republic Tool Corp., 1265 Union Commerce Bldg., Cleveland 14, Ohio. Equipment eliminates the sine-bar method of inspection by providing standard gage-block measurement for layout, checking and inspection operations. Unit is designed for both accuracy, and for quick, mass-production operations.

Two models are available both having the same basic features. The Universal model has bench centers for smaller, more flexible applications while the Master model takes up to 10-in. dia. work capacity.

6 Diameters, 2 Necks and 2 Chamfers on a 19½" Shaft . . .



. . . MONA-MATIC MACHINING TIME — 2.81 minutes

Here's a new wrinkle in high-speed shaft turning—for "*Peak Production at a Profit*".

Load. Push the cycle start button. The Monarch Mona-Matic does the rest; automatically and fast.

It's a powerful (10 to 20-hp capacity), high-speed machine, suitable for both first and second operation work. Multiple diameters, tapers, faces, radii and chamfers are turned by the single "Air-Gage Tracer" controlled cutting tool on the front carriage, guided from thin metal template or master workpiece. Tools on the rear slide perform necking, grooving and forming cuts.

This combination reduces the number of tools to the absolute minimum. Setup is accomplished in but a fraction of the time required when separate tools are employed for each cut.

The results possible with this tool for timesaving are typified by the job illustrated—a steel shaft, machined *complete*—in a matter of minutes—and a simple, versatile setup, equally adaptable to a wide variety of production work. May we show you how it can fit your requirements?

THE MONARCH MONA-MATIC

This modern, timesaving machine is a natural for high-speed precision metal turning with carbide tools. It's available in a number of speed ranges: 1000, 2000, 3000 and up to 4000 R.P.M.

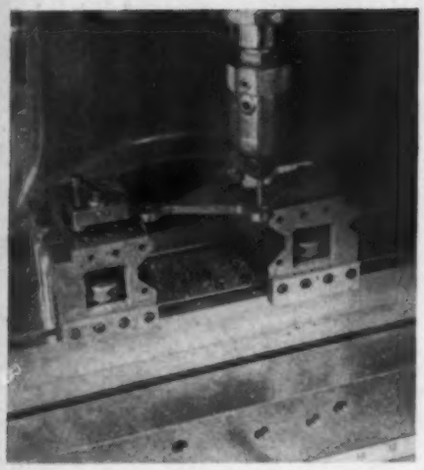
The rear tool slide cycle may be cut in at any time during the front tool cycle. Or the machine may be used with the front single tool cycle only.

Supplied with a magazine loading device instead of the rear slide, the Mona-Matic becomes a completely automatic turning machine.

THE MONARCH MACHINE TOOL COMPANY • Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE
Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER*—TURN TO MONARCH

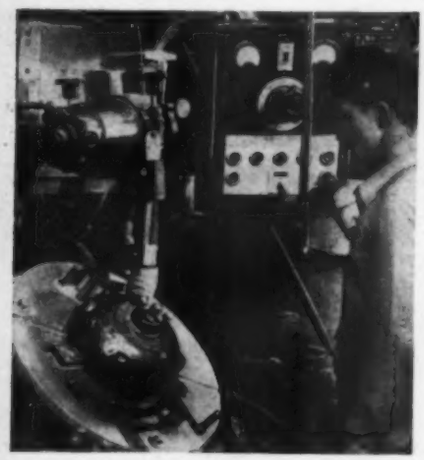


Holding Fixture by Hanson Checks Accuracy by Indicator

A holding fixture for use on jig boring and jig grinding machines is offered by Hanson and Co., Detroit 11, Mich. Standard length of base is 16 in. Fixture consists of a base and two sliding mounting blocks as well as the necessary clamps and screws. Between each grinding operation the three pieces are stabilized through deepfreeze procedure, which is said to eliminate the possibility of distortion.

An indicator checks accuracy starting from any point of the base. Indicator will show an accuracy of 0.0002 in. on any plane or point of the fixture.

Adaptable to vertical mill, drill press, profile machine, slotter, and engraving and etching machine, special lengths of base are available.



Westinghouse Weldomatic Welder Combines Necessities in One Unit

A single unit including welding head, control equipment, welding transformer and work-positioning equipment, is offered by Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa.

Called the Weldomatic welder, the standard head, suitable for welding ac. or dc., operates with a capacity of 1200 amp. ac. Head is designed for 360° rotation in the vertical or horizontal plane.

Nozzles and knurled drive wire-feed rolls are supplied to accommodate ⅛-, 5/32-, 3/16-, and ¼-in. wire. Wire-feed is automatic.

DOUBLE-SLEEVE AIR-OPERATED mandrel Model 601-AT-5A1, made by Erickson Tools Div., 2309 Hamilton Ave., Cleveland 14, Ohio, combines the Erickson precision mandrel and air cylinder. Steel tubing with inside diameters ranging from 2½ to 3 in., is held automatically for straddle-facing and turning. Air chuck principle is utilized to actuate special drawbar mandrel. By substituting two standard air-chuck parts for the mandrel assembly, fixture can be converted to an air-operated collet chuck

Portable Drillpress by Dremel Attains A Speed Near 27,000 rpm.

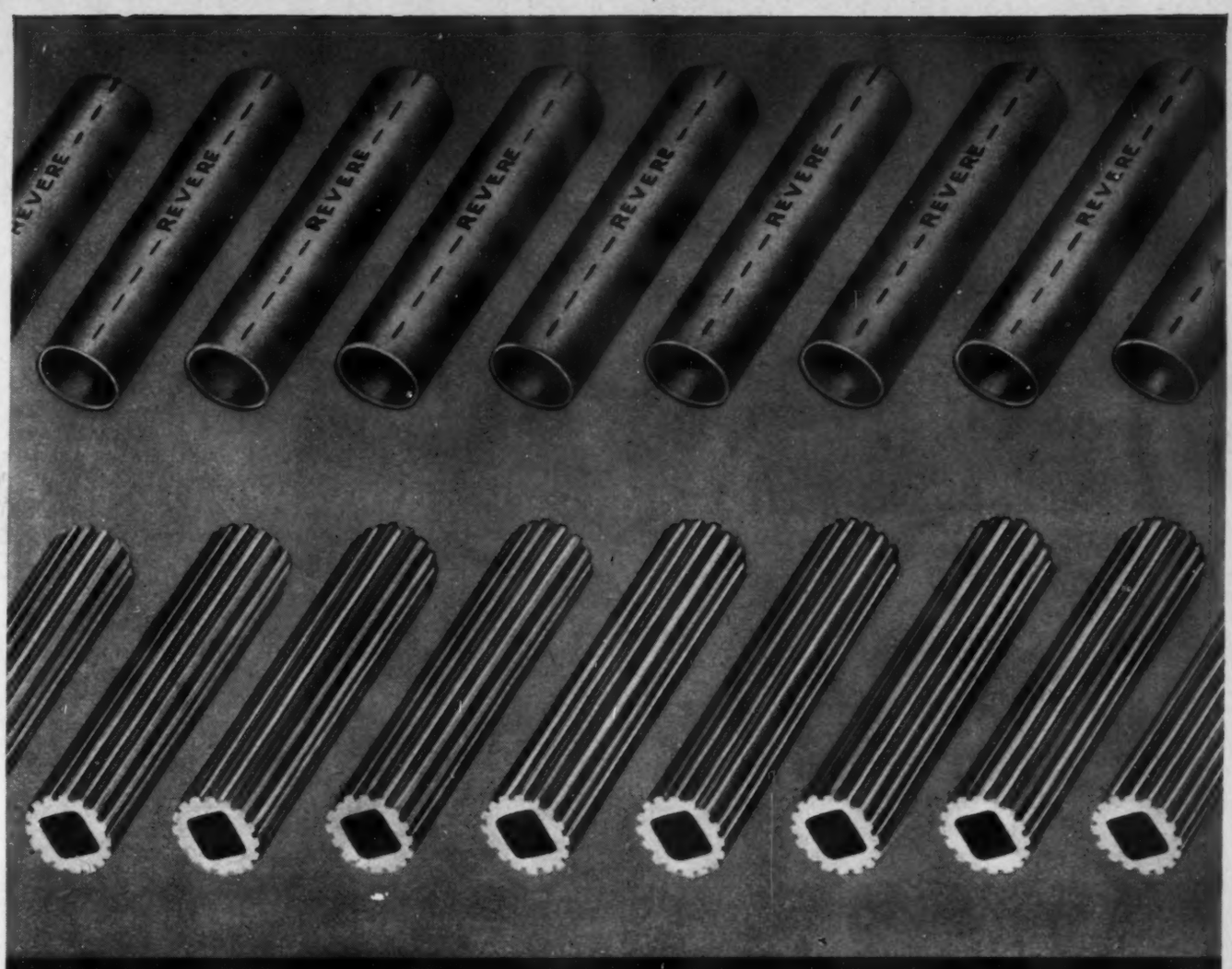
A light portable drillpress for handling fine work is offered by Dremel Mfg. Co., Racine, Wis. Press is powered by a No. 2 Moto-Tool which is capable of attaining a speed of approximately 27,000 rpm.

The power unit is held by a sturdy toolclamp and can be raised, lowered, swung in any direction, or removed for off-hand use. Work is brought to the drill on a 3¼-in. table having a 1⅜-in. stroke. The table is raised and lowered by a rack and pinion gear operated by a knob. Adjustable table has a depth gage for fine control. Drillpress is 12x6¾x4 in., and weighs approximately 3½ lb.

Line of ac. Arc Welders by Kern Offers Stepless Amperage Control

A line of ac. arc welders is offered by John A. Kern Co., 22439 N. Loomis St., Chicago 7, Ill. Three industrial models, 200, 300, and 400 amp., and two models for farm and general shop use, 130 and 180 amp., are included.

All models are said to produce high power factors therefore reducing the "no-load" losses. The movable core on all models travels less than 1 in. to cover the entire range of stepless amperage control. Quiet operation is said to be obtained.



LOWER YOUR FABRICATION COSTS
with REVERE ALUMINUM TUBE and EXTRUDED SHAPES

THE uniform quality of Revere aluminum alloy tube and extruded shapes is typical of the high standard of quality that has been characteristic of Revere for nearly a century and a half. To users, this uniformity means lower fabrication costs. The greater consistency from shipment to shipment reduces the need for continual adjustment of your fabricating equipment and techniques. Your production flows smoothly; and the result, *according to Revere customers,* is a worthwhile saving in fabricating time and a consequent reduction in costs.

You make further savings as the result of the excellence of the finish on Revere aluminum alloy extruded shapes. *Users report* that they can cut and color to produce a superior finish in less time than is required for the same operations on competitive materials.

Revere produces aluminum alloy tubes in sizes up to about 3½" O.D. and in many wall thicknesses. The alloys available are 2S, 3S, 4S, 24S, 52S and 61S.

Revere aluminum shapes can be extruded from many alloys to your designs. They can help you simplify difficult design problems as well as reduce your fabricating and assembly costs.

The Revere office nearest you will be glad to give you more complete information about Revere aluminum alloy tubes and extruded shapes as well as technical assistance in their application.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities.

Parts and Materials

Single-Phase Induction Motor Avoids Wound Armature, Brushes

A single-phase induction motor, similar to the improved polyphase induction motor, is announced by Westinghouse Electric Corp., 306 Fourth Ave., Box 1017, Pittsburgh 30, Pa.

The capacitor-start, single-phase motor is said to be sturdier, and has pre-lubricated bearings said to require no attention for at least five years. Starting-torque characteristics have been improved so that the unit can now compete with the repulsions-start, induction-run motor. Motor has high-torque valves from standstill to full speed. It avoids the wound armature, brushes, brush-holders, and short circuiting devices.

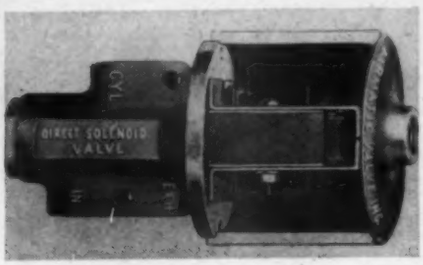
The capacitor-start motor is electrically reversible. A centrifugal switch of improved design is used on motors rated 1 to 3 hp. at 1750 rpm., and 1½ to 5 hp. at 2600 rpm.

Rotors of all single-phase motors are given a heat treatment after assembly. This burns off the punching burrs that provide short-circuit paths for eddy currents.

Elemoto Dimension Calculator Adds, Subtracts Fractions

A calculator for addition and subtraction of fractions of inches, and inches and feet by mechanical means, is introduced by Elemoto Sales Co., P. O. Box 62, Teaneck, N. J. Results of solved problems appear in figures in a window.

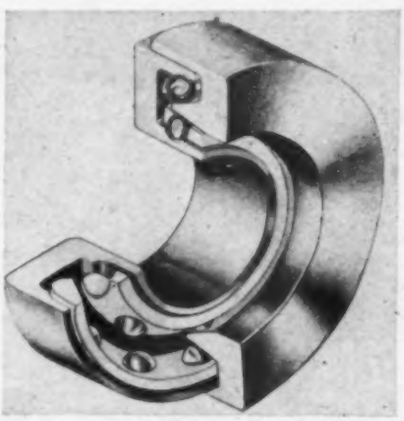
Called the Elemoto Dimension Adder and Subtractor, its design enables a supplied pointer to turn a disk, similar to a telephone dial. Full inches and feet are on another dial tied in with the fraction-of-inch dial.



Solenoid Valve by Airmatic Eliminates Pilots, Levers

A non-corrosive, full-capacity, 3-way direct-operating solenoid-controlled valve, Model DS-3, is offered by the Airmatic Valve, Inc., 1643 E. 40th St., Cleveland, Ohio. Unit eliminates pilots, levers and other types of indirect control.

The solenoid is rated 1.42 amp. inrush, 0.22 amp. holding at 110 v., 60 cycles. Available in four standard pipe sizes ¼, ⅜, ½, and ¾ in.



Angle-, Radial-Type Bearings By Pal-Vin Distribute Load

Radial- and angle-type bearings designed to distribute substantially the load throughout the circumference of the bearing, is introduced by Pal-Vin Machine and Mfg. Co., Cleveland, Ohio.

Also featured is the increased-load sustaining capacity afforded by multiplying the rows of rotating bearing elements built into the bearing. Design covers bearings of multiple-ball type, multiple-pin, multiple-roll, combination pin and roll, ball and roll, and oil combinations involving balls, pins and rolls.

PRD Coating Compound by Detrex Applied with Brush, Spray Gun

A coating compound for use on the walls of paint-spray booths has been developed by Detrex Corp., Box 501, Detroit 32, Mich. Called Triad PRD, it is a light-colored, semi-liquid material that can be applied with a brush or spray gun. For spraying, a 20% dilution, four parts of compound to one part water, produces a viscosity that can be handled in a pressure tank. The coating dries and forms a white coating to which paint overspray adheres.

American Flexible Coupling Utilizes Oldham Principle

The American flexible coupling designed to permit shafts to operate misaligned without transmitting reactionary stresses, is marketed by the American Flexible Coupling Co., Erie, Pa.

Design is based on the Oldham principle. Each of two jaw flanges mounted on the shafts, engages opposite parallel surfaces of a square center member, the engaged surfaces of each being at right angles. The center member slides between the two integral jaws of each jaw flange in directions relatively at right angles as the whole coupling rotates, transmitting the torque.

BROACHING CUTS COSTS FASTER!

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

BEST BY TEST

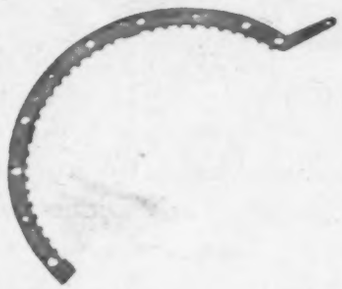
Colonial broaches represent the fastest, surest, precision method there is for removing metal. May be used equally effectively for all kinds of internal or external shapes, regular or irregular.

Wherever they CAN be used, they are bound to give you greater output per machine hour—and that means REAL SAVINGS—savings that pay for the tooling cost in a surprisingly short time.

There's a Colonial field representative near you. Ask us to have him figure where and how much *you* can save; how much you can boost your output per machine hour.

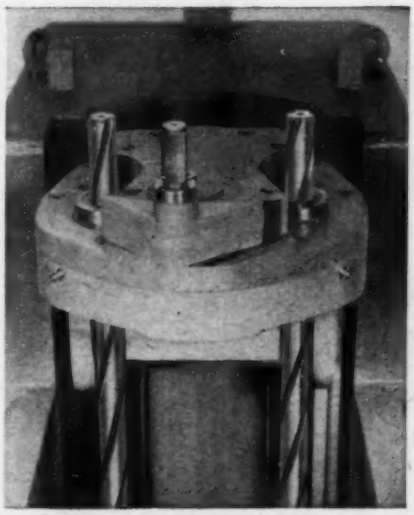
—STEEL— —BRONZE— —COPPER—

Internal Gears and Splines

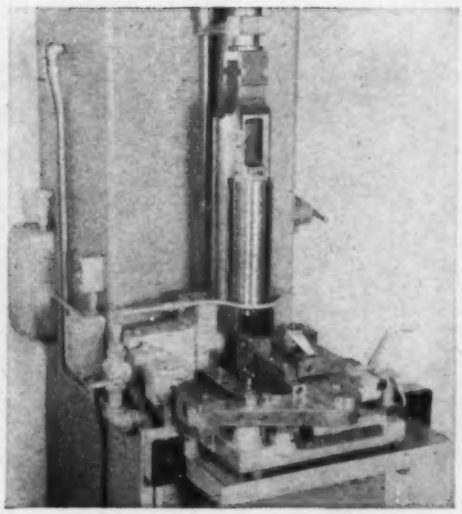


Telephone Relay Parts

Electrical Breaker Arms



One pass of the broach and the internal gear or spline is finish-cut. Accuracy is insured by Colonial's specially developed involute and other broach checkers and grinding methods.



It is impossible by any other method to maintain the accuracy of the cam teeth on parts like these while getting the production obtained with Colonial Broaches (360 per hour at 85% efficiency).

800 to 1000 pieces per hour on one machine with the two sets of Colonial broaches shown here (one set also 'disassembled' to show simplicity). Parts are broached 8 at a time.

A Metal ROSE

By another name

IN THESE DAYS OF STEEL SHORTAGES

NM

In these days of critical steel shortages many manufacturers are saying: "If there is another rose that would smell as sweet, lead us to it." If you use bright plated metals for decorative or functional use, we offer substitutes for steel base metal . . . and they are AVAILABLE! We refer to such Nickeloid Metals as Chrome or Nickel plated to base metals of zinc, copper, or brass. All are available in sheets, in coils, bright or satin finish; coated one or two sides; in a wide range of gauges, tempers.

Nickeloid Metals using such base metals as zinc, copper, or brass are *time-tried* and *proven*. All are easily workable, and for many applications can be used as a satisfactory alternate for steel — at no extra fabricating cost. Ask our representative to call.

Free New Booklet Tells
USES for NICKELOID METALS

This colorful illustrated booklet tells many of the ingenious ways in which manufacturers are using Nickeloid Metals to improve the appearance and marketability of their products. Write for it on your company letterhead.

50 Years of Pre-plated Metal Leadership

AMERICAN NICKELOID COMPANY

Established 1898

PERU 7, ILLINOIS

ROUND TABLE Discussion

VACATION—A LOAF OR A LEAVE?

Change of environment can work wonders in some people, but others abhor change. A foreman who never took holidays tried to convince his men that porridge taken every morning would enable them to dispense with holidays. His excellent and abundant energy certainly gave point and emphasis to his contention 'til he left the fifties behind him. Then he was compelled for health reasons to take a long rest, but he never recovered sufficiently to resume his place among those who felt an occasional break was necessary.

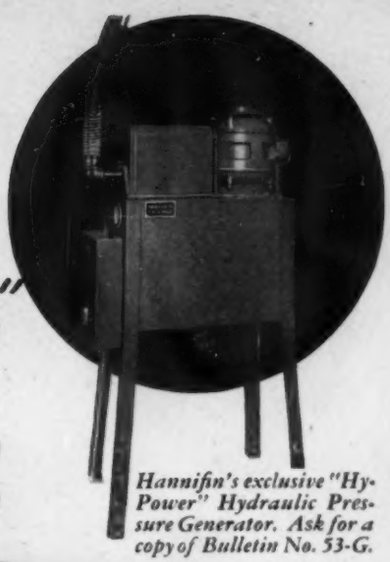
Change of environment can, in a measure, compensate for lack of change of occupation. One cannot imagine a bus driver getting much fun out of driving over the same ground for years on end, but a change of territory could stimulate interest and banish boredom for a time. The same is true of the skilled machinist engaged in repetitive work; a move to a new shop, even if on similar work, can be brimful of interest to the receptive mind, and when healthy interest is aroused, good has been accomplished. But the effect of change, without rest, like that of a drug, wears thin in time.

At considerable initial inconvenience to himself and although experiencing some fall in production during the early stages, the writer makes a point of "changing around" men engaged on monotonous work. The effect on those who like change is often quite remarkable, and eventually better production figures result. Experience and length of time on a job have definite production advantages, but new avenues are always at hand waiting to be explored, and the impact on production of the new mind and fresh outlook should not be ignored.

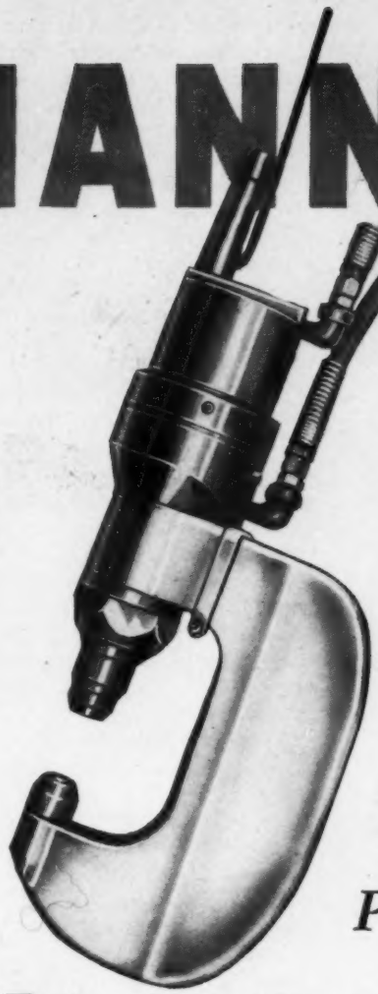
Change of environment, in the wider sense of moving to a new district, is usually obtained only at considerable expense and trouble, and while it offers new scenes and experiences, it is questionable if it could entirely compensate for lack of change of work. Few married men, for example, can afford to keep moving around when the new neighborhood becomes familiar as the old, so perhaps change of occupation in

HANNIFIN

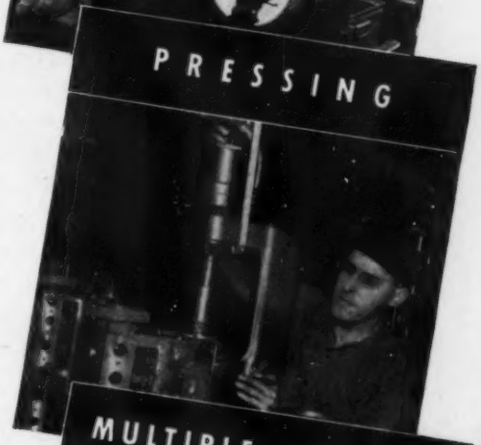
"hy-power" HYDRAULIC UNITS FOR

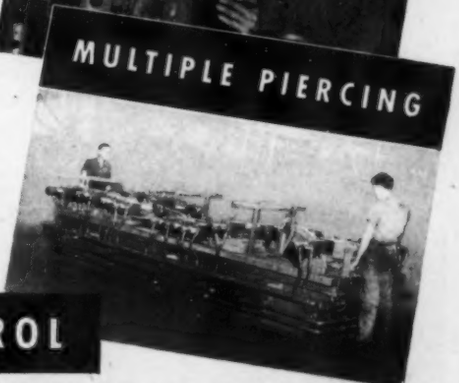


Hannifin's exclusive "Hy-Power" Hydraulic Pressure Generator. Ask for a copy of Bulletin No. 53-G.



FAST!
EFFICIENT!
PORTABLE!





FOR prompt, dependable help in getting tooled up for efficient production, use Hannifin "Hy-Power" Hydraulic Units.

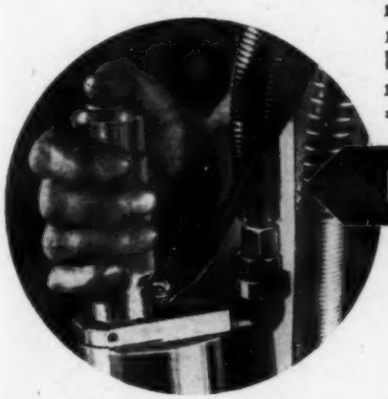
COMPLETE LINE—Portable and stationary types. Standard and special designs available for riveting, pressing, punching, piercing, crimping. Dies for every purpose. Capacities to 100 tons; reach to 6′ or more.

FAST—Time cycle for standard riveters ranges from 1½ seconds to 3 seconds for 3″ or 4″ stroke units.

EFFICIENT—More work with less effort, no noise. Easy to maintain almost unbelievably high production rates. Low power costs. Every operating convenience.

PUSH BUTTON CONTROL—A single push button* gives you complete control. Hold button down and riveter goes through one complete cycle automatically: rapid advance stroke at low pressure . . . short power stroke at full pressure . . . automatic return to starting position. To repeat cycle, release and again depress button. For instant safety at any point, release button and ram retracts.

*Foot control also available.



PUSH BUTTON CONTROL

HANNIFIN CORPORATION

1101 S. Kilbourn Ave. HANNIFIN Chicago 24, Illinois

AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

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Now Distributed Nationwide by **WENDT-SONIS**

CRITERION
BORING HEADS
and other tools

Features of CRITERION Boring Heads

- SMOOTH, COMPACT, RIGID . . . MAINTAINS ORIGINAL ACCURACY OVER LONG PERIOD
- PARTS SUBJECT TO WEAR, ARE HARDENED
- LEAD SCREW OF HARDENED TOOL STEEL, THREADS GROUND FROM SOLID AFTER HARDENING.
- LARGE GRADUATED DIAL
- SHANKS INTERCHANGEABLE

DEPEND on Wendt-Sonis for your Boring Tool requirements as well as carbide cutting tools of all types. You'll get prompt service, in most cases shipment "out of stock" on standards. W-S Criterion Boring Heads and Bars are available as single items or in toolroom sets consisting of single heads and bar sets or combinations of large and small heads with complete sets of bars. They make a complete accessory for any jig borer or toolroom milling machine.

New W-S* CRITERION *Catalog
Contains latest data, sizes and prices. WRITE: Wendt-Sonis Company, Hannibal, Missouri; 580 North Prairie Ave., Hawthorne, Calif.; 1361 West Lake St., Chicago, Illinois.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS REAMERS • ROLLER TURNING TOOLS • SPECIAL TOOLS

a familiar setting is not altogether without attraction.

In justice to the "machine," a man, if he is normally employed on work demanding physical exertion, is in honor bound to relax when on holiday. The degree of physical effort which his normal employment demands should determine the amount of relaxation required, and most people benefit enormously from a restful holiday.

W. D. Mackinnon
Airdrie, Scotland

•

LEARN OR EARN?

Since the start of the war, the increases in wages for machine operators, together with bonus systems to increase take-home pay, have presented problems.

Who isn't interested in more money and who wouldn't move to some other job if it would pay half as much again base rates with a possibility of 10 to 15% bonus? I'm sure that Al and Ed would, as well as most others.

It is extremely hard for a young fellow today, when prices are way out of line, to be able to see why it is of value to learn a trade. It requires several years of intensive training to be able to qualify as a machinist. Wages are often low, for industry has lost sight of the value of journeymen.

How can we make apprentice training interesting? There are at least two ways. First, inauguration of proper educational programs in trade schools that make it possible for graduates at 20 or 22 to become full-fledged machinists after a one-year industrial training period. Or even to become graduate machinists if the policy of cooperative work was carried on by the schools.

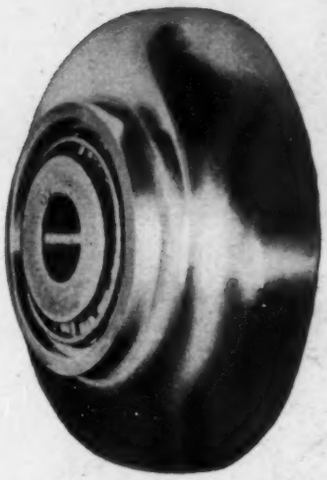
With this pre-educational program backed by industries, the trade would be encouraged since the wages paid the full-fledged journeyman is usually higher than that paid to the machine operator . . . thereby industry would be able to keep men on the job.

The other method is not so sure-fire, but it certainly would help. Industry has forgotten in this day of rushing that certain types of work can only be done at a more or less set rate of speed. Supervisors, and top management especially, who are not familiar with machine-shop work too frequently openly condemn operators for being lazy. Because the worker has time to talk with another worker does *not* mean that he is idle or not doing all the work possible. His machine, being

Your machines will last longer

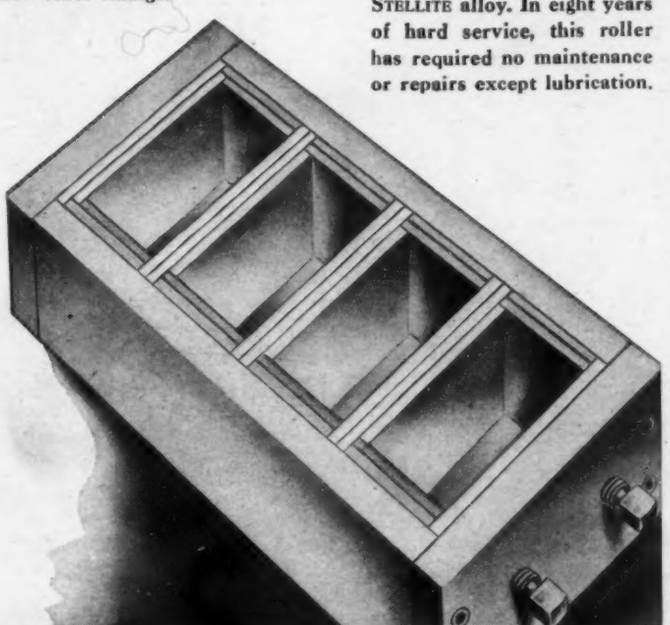
When Vital Parts Are Made of HAYNES STELLITE Alloy

Resists Abrasion—This bushing, made from HAYNES STELLITE alloy No. 6, is used for a ship turbine control mechanism. It resists severe abrasion.



8 Years Service — Burnishing roller made of HAYNES STELLITE alloy. In eight years of hard service, this roller has required no maintenance or repairs except lubrication.

10 Times Longer — HAYNES STELLITE alloy No. 93 brick mold liners, last up to ten times longer than other linings.



Safeguard the vital points of your machinery and equipment by using wearing parts made of HAYNES STELLITE alloy. Parts made of this hard, tough alloy last longer and give more efficient service. This means less down time for replacement and repairs. HAYNES STELLITE alloy stays hard and wear-resistant even when subjected to severe abrasion, erosion, heat, and corrosion.

You can obtain HAYNES STELLITE alloy parts made to your specifications and finished to close tolerances—ready for use. For more information write or phone to our nearest district office!

TAKE ADVANTAGE OF THIS COMBINATION OF PROPERTIES

1. HAYNES STELLITE alloy is inherently hard and abrasion-resistant, even at red heat.
2. HAYNES STELLITE alloy is resistant to atmospheric corrosion and many corrosive chemicals.
3. HAYNES STELLITE alloy takes a high polish.
4. HAYNES STELLITE alloy has a low coefficient of friction.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Chicago — Cleveland — Detroit — Houston — Los Angeles — New York — San Francisco — Tulsa

The registered trade-mark "Haynes Stellite" distinguishes a product of Haynes Stellite Company.

automatic . . . or partially so . . . is running and it is a period of "waiting time" for him. However, since he is seen to be idle and the official is not familiar with how the machine operates, the worker is called down.

Indirect bonus systems, when properly applied, help keep machine-shop men better satisfied. They are the men who help keep production workers' machines rolling. So, in order to help the apprentice worker and the junior machinist on the job, we must give them a better break. But we must not baby them . . . they must do their job and we, in return, will give them full credit for doing it.

Charles D. Townsend
Centralia, Mo.

•

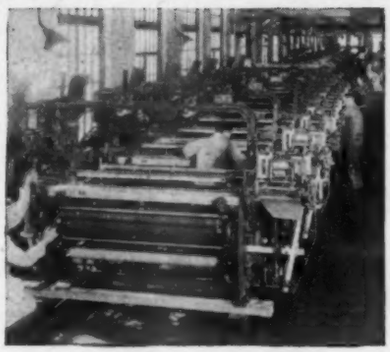
When the apprentice shows dissatisfaction with, or apparent lack of understanding of the future value of his present apprentice training course, indications are that the system may be functioning improperly, or being poorly administered, or the apprenticeship system being used does not conform to the new national programs recently formulated. The apprentice fails to understand that under an adequately functioning apprenticeship system, "Learn or Earn" becomes "Learn and Earn MORE."

An effective apprenticeship system requires more than having the apprentice acquire a familiarity and skill in the use of the usual tools of the craft; it also embraces knowledge of mathematics of the trade and the ability to read and interpret blueprints and specifications. The apprenticeship also covers the application of trade knowledge and skill on the actual job, where the apprentice is checked and supervised. Adequate rates of pay and periodic promotions are part of a workable apprenticeship system.

In some crafts, the apprenticeship systems have been allowed to degenerate. They have not been adapted to changing needs of modern production. Responsibility for these deficiencies cannot be charged simply to management or labor. They are jointly responsible for the situation. The deficiencies of the system are obvious to any critical student.

In many cases, apprenticeship has been used not to train new workers, but to restrict entrances to the trade. This result is accomplished by setting requirements at such a high level that interested young people are discouraged from entering, or by specifying that the ratio of ap-

Low Tool Cost aids high volume, low cost Textile Loom Production



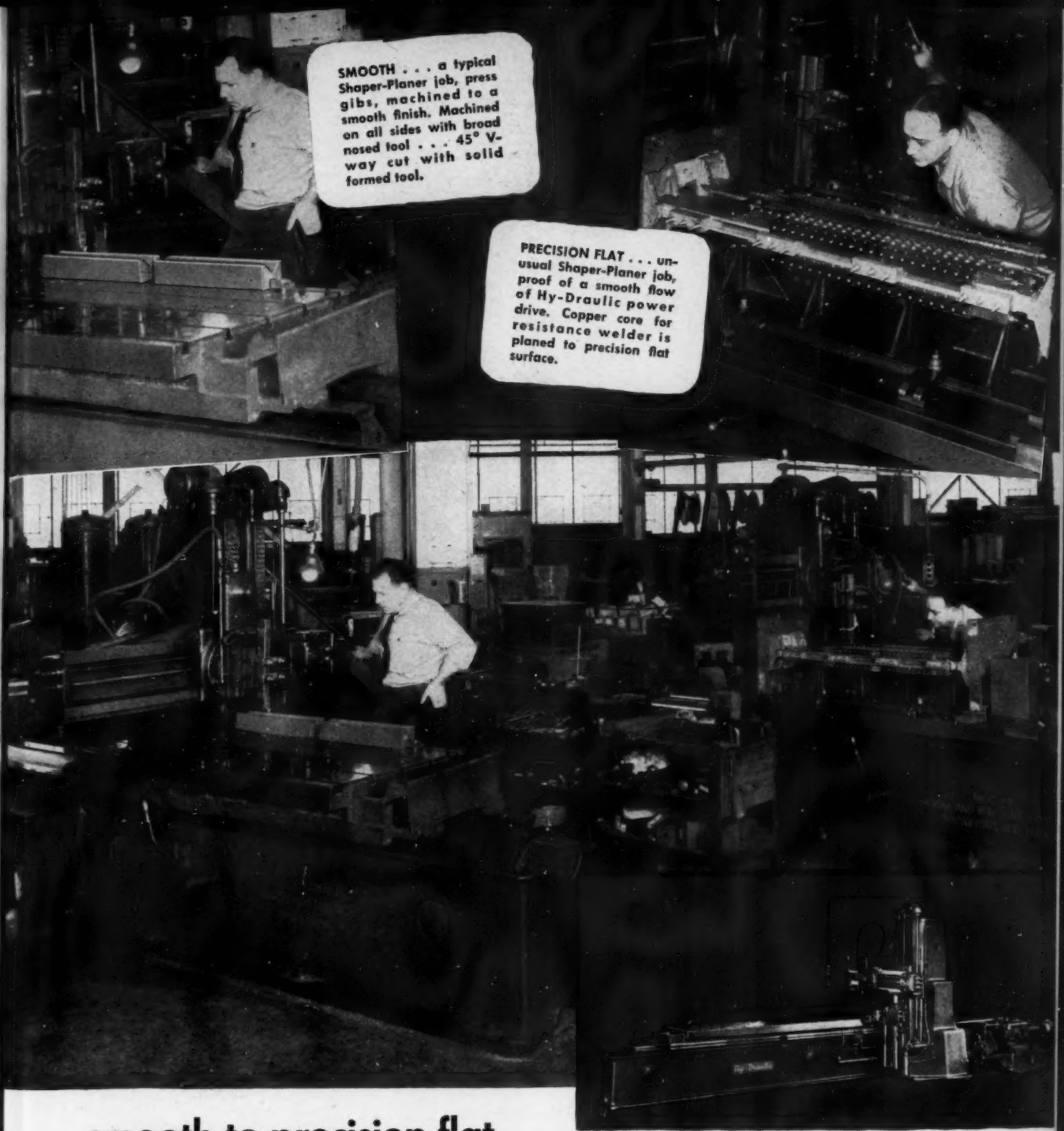
Mr. O. V. Payne, Works Manager, Crompton & Knowles Loom Works, Worcester, Mass. highlights cost reducing McCaskey Tool Control in this way:

"We have used McCaskey Methods in our main tool crib and three of our subsidiary cribs since 1941. The manufacture of over 100,000 textile loom components has benefitted by speedier tool service and lower tool costs.

"Specifically McCaskey has: (1) Speeded up tool crib operation, (2) tied responsibility for specific tools to specific employees, (3) location of all tools on the floor can be speedily ascertained, (4) cut our tool inventory by disclosing dead and infrequently used tools, (5) cut excessive inventory of many active items, and (6) provided us with the medium for detailed analysis of tool loss, breakage, use and performance . . . all contributing to low tool costs."

Let us have a qualified representative explain how McCaskey Control will save from the beginning in your plant . . . or send you proof of McCaskey savings in several other well-known plants.

McCaskey INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL
THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO
McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England


SMOOTH . . . a typical Shaper-Planer job, press gibs, machined to a smooth finish. Machined on all sides with broad nosed tool . . . 45° V-way cut with solid formed tool.
PRECISION FLAT . . . unusual Shaper-Planer job, proof of a smooth flow of Hy-Draulic power drive. Copper core for resistance welder is planed to precision flat surface.

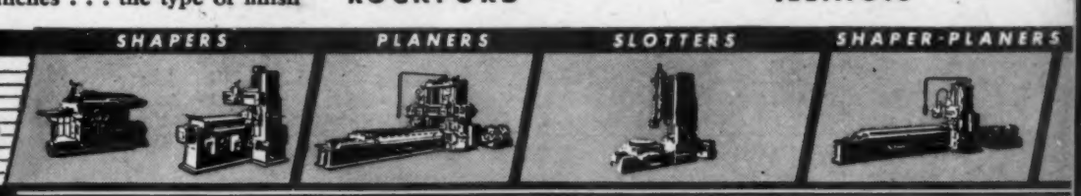
smooth to precision flat

4712

Unusual accuracy of the Rockford Hy-Draulic Shaper-Planer is demonstrated by the above installation. Machining the gibs to a smooth finish is a standard job, typical of the hundreds of small planer jobs that are easily and quickly done on a Shaper-Planer. But machining the copper core of a resistance welder is a most unusual job . . . and proof of the absolute smoothness of the Hy-Draulic cutting stroke. The finish obtained on this work with the Rockford Hy-Draulic Shaper-Planer was a surface that checked precision flat within a tolerance measured in micro-inches . . . the type of finish ordinarily obtained only by high speed carbide milling or by surface grinding. Rockford Hy-Draulic Shaper-Planers are always fast, always easy to set-up. In addition they give you the maximum in work accuracy that only quality machine construction plus the even flow of Hy-Draulic drive can provide. For complete facts write for Bulletin 445.

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

Hy-Draulic

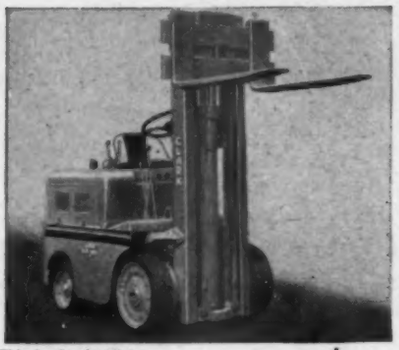


MATERIAL HANDLING News

With this high-lift, low-clearance attachment, a Clark fork truck can take material through a freight car door and tier loads to the car roof, as well as tier loads rafter-high in the warehouse.

TIERING HEIGHT 130" COLLAPSED HEIGHT 83" FREE LIFT 62"

That "free lift 62 inches" is the vital specification of HI-LO-STACK, Clark's new high-lift, low-clearance attachment. It means that the forks can be raised 62 inches from the floor before there is any increase in the overall height of the machine.



This is the CLARK HI-LO-STACK combines high lift and low clearance

83 INCHES OVERALL HEIGHT, FORKS LOWERED | NO CHANGE IN OVERALL HEIGHT WITH "FREE-LIFT" OF FORKS UP TO 62 INCHES | UP-UP-TO 130 INCHES—22 INCHES ADDITIONAL LIFT FOR EXTRA HIGH TIERING

You recognize instantly the practical benefits of the HI-LO-STACK—it enables a fork truck to take a load through the 7-foot door of a box-car and tier loads to the roof of the car, or to tier unit loads to the rafters in the warehouse. Heretofore, with conventional lift mechanisms, the increasing height of the vehicle made it impossible for the same machine to perform all these operations; making it necessary, in many handling operations, to use two machines—one for loading and unloading cars and another for high tiering in the warehouse.

Also HI-LO-STACK is an exceedingly simple mechanism. It has only one lift cylinder, and a single set of uprights with slide members inside. Lifting is accomplished with unusually low hydraulic pressure, which minimizes possibility of leakage.

It adds up that HI-LO-STACK is a typical Clark development—sturdily built, simple as can be, a thoroughly dependable unit; a good example of the sound engineering and incomparably rich knowledge of handling operations for which Industry looks to Clark. Write for particulars.

CLARK GAS AND ELECTRIC POWERED **FORK TRUCKS**
AND INDUSTRIAL TOWING TRACTORS

CLARK EQUIPMENT COMPANY, TRUCTRACTOR DIVISION, BATTLE CREEK 3, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

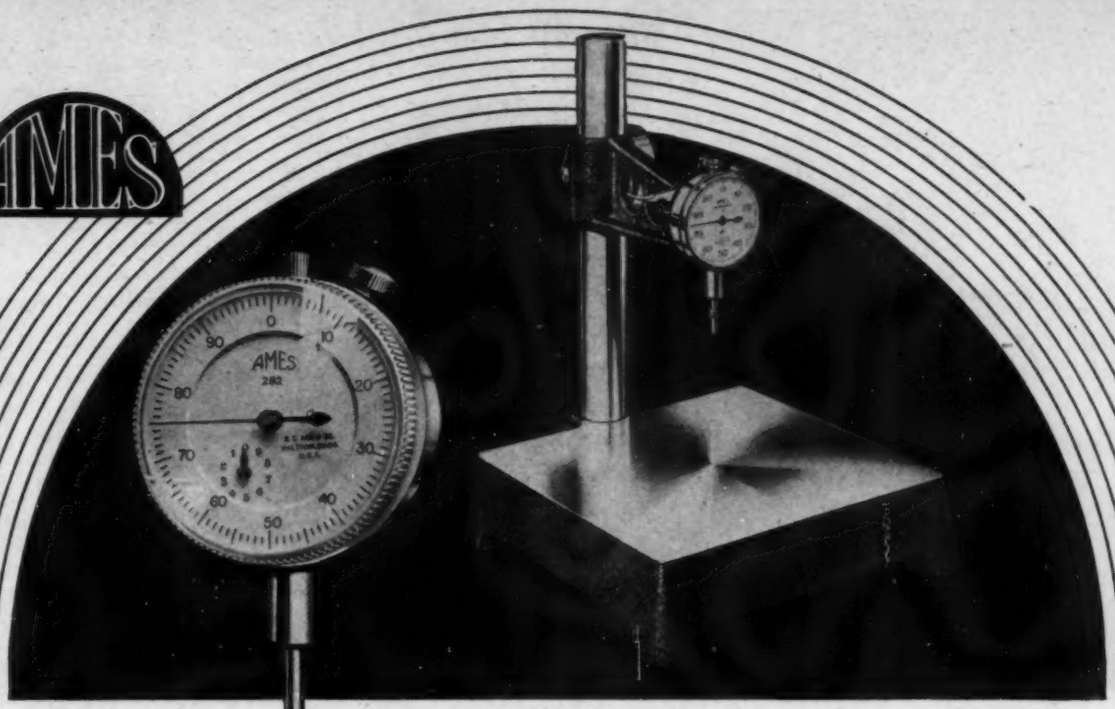
prentices to journeymen shall be maintained at low levels. Frequently, employers have been unwilling to clutter up their shops with substandard workers. Equally often, journeymen have been unwilling to sacrifice earning and devote their time to training new workers.

Labor has zealously guarded its right to regulate the terms of apprenticeship, although there is serious question as to the necessity for such long periods as have been specified in some trades. Certainly the specification of arbitrary periods of apprenticeship takes no account of individual differences in learning and, in itself, offers no incentive for unusual application on the part of the apprentice. Often excellent journeymen may be poor teachers, so the time of apprentices may be inefficiently utilized under their direction. As a result of these conditions, some apprenticeship systems have not met the needs of the modern economy.

Future needs for skilled and trained workers cannot be met under archaic apprenticeship systems. An effective program of apprenticeship should provide for written contracts specifying the kind of training to be given, length of apprenticeship, hours to be devoted to training on the job and in the classroom, and wages of apprentices.

However, a number of large industrial firms have established carefully planned apprenticeship training programs in recent years. Classroom work in the local vocational school is included in some of the programs. Provisions of the program specify a wide range of training and prevent management from retaining the apprentice on any one machine simply because he shows proficiency there. Regular advances in wage rates are provided, and a bonus is payable on graduation from the course. In addition, piece rates are so arranged that the apprentice may earn more than his guaranteed wage if he shows unusual ability at any time throughout the period. A special supervisor of apprenticeship is provided by the management. He maintains a record of the advancement of each apprentice.

The salient features of the new apprenticeship training movement are apparent from these examples. It is to be hoped that the future will see more wide-spread adoption of such plans and more general cooperation between the various crafts and managements which can provide opportunities for systematic training. Certainly the development of such plans is a responsibility of both



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LONG RANGE INDICATOR No. 282

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When you want to measure those decimals with maximum dollar savings, do it with an AMES DIAL COMPARATOR such as Model No. 13 shown above. Quickly and easily set to the required dimension. Maintains its setting even with rough usage. Gives instant, *accurate* readings — independent of the human factor. You'll find no other Comparator gives you such high production while saving so much in time and labor.

The 8″-square cast-iron base may be fitted with V-blocks, anvils, or stops of various kinds. The indicator-holding bracket extends 4″ over the base and is easily adjustable on the 9″ column. Measuring capacity is 6″. Net weight 16 lbs.

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The Department Store Idea

When you think of a Ryerson Plant, picture a huge department store featuring all kinds and shapes of steel. In place of the ordinary sales personnel, think of a large staff of experienced steel men—a sales department that's been carefully trained to guide your steel purchasing—to see that you get the exact steel you need for the job at hand.

And, when you think of Ryerson Steel-Service, think of a smooth-flowing system of steel supply that eliminates every unnecessary delay between order desk and point of delivery. Think of the most modern steel storing, cutting and shipping methods—methods based on more than a century of performance. And remember that Ryerson Steel-Service functions with the same efficiency and promptness whether your order calls for pounds or tons.

Naturally, today's great demand for steel frequently unbalances our stocks. But if the steel you need is not immediately available, we'll gladly do everything possible to supply you with a practical alternate.

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RYERSON STEEL

management and labor to assure the continued growth of a skilled and efficiently trained working force.

Harry Kaufman
Philadelphia, Pa.

•

I can well understand any foreman who has got a number of apprentices being upset when the brightest among them quits. All Ed's coaching is lost effort as far as Ed is concerned, and he has to start all over again teaching another young man.

These are expensive times to live in, so if young Williams was offered a 30-40% increase, loyalty goes out the window. The boy can only see that a lot of his needs are solved by taking the new job. He doesn't consider the fact that he loses valuable experience under Ed's tuition. That would more than offset the extra dollars at the present time by enabling him to obtain a superior position later.

Other concerns have had these problems. Some have special inducements to hold the interest of the apprentice and imbue them with ambition to succeed. Prizes of valuable tools such as mikes and verniers, tool chests, or tool kits were given to the apprentices passing half-yearly tests. Tests consisted of a piece of work suitable for the year that the apprentice was in. Trips to tool shows also have been given as prizes.

However, I don't believe that prizes would be effective at the present time. I suggest that any employer give apprentices the full district rate of pay for their last year of their apprenticeship. I suggest this because I have had apprentices who, in their third year, have been better than many men several years their senior, classed as fully skilled machinists. I suggest the last year of their apprenticeship, because it is during that year that they become discontented. To merit this rate in their last year of apprenticeship they should pass a test of workmanship and ability.

Arthur Silvester
Niantic, Conn.

•

Assuming a candidate is a minor, he cannot make a legal contract; hence, an adult must vouch for him, preferably his parents.

Four of the best and most interesting years of my life were spent as a boy in grammar school reading all the mechanical and electric books I could get from the public libraries at that time. At 16 years of age, in

REINFORCED

to provide needed properties—

and SIMPLIFIED

to permit easy choice!

It took many months to study and evaluate the many cutting oils made by Houghton for war and peace-time use, and to simplify the entire line-up.

The result was to narrow down the choice into four logical groups of "reinforced" straight cutting oils, containing the additives needed for lubricity, film strength and anti-welding properties.

Particularly would we direct attention to the new CUT-MAX "400" Series—light-colored stocks mildly but effectively treated, and offering an excellent money value for production machining. For the new CUT-MAX descriptive folder, and for prices, we suggest you send us the coupon below.

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Oil of uniform clarity is delivered continuously by these two, new Hoffman units. Soluble impurities—such as air, water, gas and fuel dilution—are removed in the Hoffman VAPORIZER. And *insoluble* impurities including oxidized hydrocarbons, are filtered out in the Hoffman CARTRIDGE FILTER. Together, these two units give you complete reconditioning of oil for better, lower cost production.

FOR Removing SOLUBLES

A compact unit (portable, if desired) that passes oil over trays, induction-heated by electricity and under vacuum, to drive off fuel dilution, water, air and gas from any straight mineral, compounded or synthetic oil. ONLY TWO MOVING PARTS... no steam or water connections. Top flow rates.

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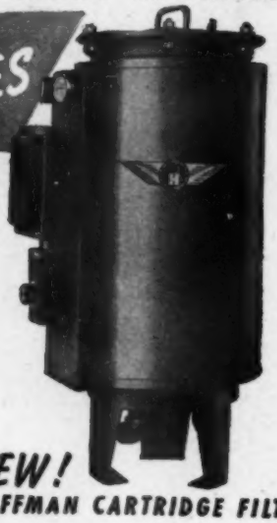
The I-1118 series of Hoffman Cartridge Filters is available in cartridge multiples of 1, 2, 3, 4, 6 and 8. Unique design and arrangement of filter element (using repackable or throwaway cartridges) provides a simple, efficient means of filtration. Available with or without heaters and controls to meet service conditions.



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COOLANT FILTERS • FILTRATION ENGINEERING SERVICE

1889, my mother approached the famous old firm, Frazer & Chalmers (now the Allis-Chalmers Co.), and induced Mr. Frazer to accept me over a large waiting list At the age of 21 I completed my contract and still have my apprenticeship papers.

My routine was a 60-hour week at $3.75 for the first year, with a raise of a dollar a week per year. The fourth year I received $6.75 per week, and twenty-five cents, held out each week to hold your contract, added up to $52, which you received when the year was finished. All the boys were rotated on basic machines, floor and bench. There was an esprit de corps among the men, and the company took a real interest in all the boys.

Today money is too easy, and everybody thinks of the present and figures the future will take care of itself. A plan that might help to correct these defects would be that when a promising candidate applies to learn the machinist's trade, he and his parents should be asked to put up a cash bond for $400. When the apprentice has worked one year and proved his aptitude to continue, $100 of the bond should be returned. He then continues his work, reducing his bond $2 per week. That is, he gets his pay plus $2 every week. He redeems his bond in total one month before finishing his apprenticeship.

If they hesitate on the bond, let it be placed in escrow, with a third party; if they still demur, they don't mean business.

Edward M. Mikkelsen, M.D.
Chicago, Ill.

•

WORK THE RULES OR RULE THE WORKS?

In a large works you must have a fairly comprehensive and watertight set of rules. Loath as I would be to take away authority from the foreman, I would say that before departing from the rules in any specific case, the foreman should obtain authority from a higher executive.

For once my sympathies are almost entirely with Ed. Twenty foremen mean 20 different rulings on any case, unless they are guided by a specific rule. Rules should be kept as simple and concise as possible and should be posted where they can be seen by all. The nature of the penalties involved in case of infringement of the more important rules should be clearly stated. All new employees should be given a copy of these rules to read and be required to sign a form to the effect that they have read them, since 9

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NICROMAN TOOL STEEL
MIX 827

• Nicroman Stripping Shear, used for cutting high carbon hedge shear stock. In use for one and one-half years and still going strong. Carbon Steel Shear formerly used ran only 4 to 6 months.

NOTED FOR UNUSUAL TOUGHNESS AND RESISTANCE TO TRANSVERSE STRESS

Nicroman comes as close to being an "all purpose" steel as any other tool steel made. Many users have adopted it as standard for all their tools except those requiring high speed steel. The result is a saving in inventory stocks, avoidance of misuse of a brand, simplification in heat treating and better tool performance.

The success of Nicroman is due to many factors:

... Non-deforming qualities of an oil hardening steel.

... Long wearing characteristics of a chromium alloy.

... Toughness imparted by addition of nickel.

... Dependability in heat treatment resulting from low hardening temperature and mild oil quench.

... Resistance to edge spalling.

All combine to make Nicroman a serviceable, dependable tool steel that can be used to advantage for hobs, punches, shear blades, spindles, hammers, machine parts, dies and many other tools.

ANALYSIS

Carbon	.70%	Nickel	1.65%
Manganese	.40%	Chromium	1.00%
Silicon	.20%	Copper	.35%

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- CHAMFERING
- POINTING
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Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.

No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

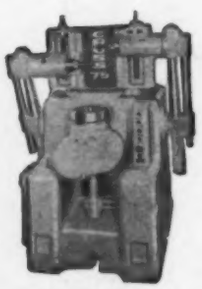
Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.



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times out of 10 the excuse trotted out for a breach of rule is, "I didn't know."

Unless guided by clearly worded rules, no two foremen will treat identical offences in an identical manner, for no two human beings think alike and have identical reactions. It is a very true saying that "hard cases make bad law," and trying to legislate for them is going to head you for far more trouble than legislating along sound and equitable general lines. Variation of treatment for breach of rules is a most potent source of bad feeling, trouble, and general discontent, and the only way to avoid it is to have uniformity of treatment.

There is a vast variation in the heinousness of the crime of murder, but in this country there is only one penalty, and the system works quite well in practice. The judge is analogous to the foreman, and has no discretion, but the home secretary on the judge's, or other competent authorities' advice, has. For home secretary, read chief personnel officer.

In conclusion, I wonder if Al is optimist enough to think there are no headaches on a farm?

K. N. Harris
Harrow, England

•

EXPERT OR EXECUTIVE?

A foreman should be both an executive and expert. In today's labor relations theory, there seems to be too much emphasis on supervision. It is a mistaken idea that all you have to be is a lovable guy and pat the boys on the back and they will work their fingers to the bone for you and the company; human nature does not change and the average employee will not do more than he has to. If he does more he is above average and will soon be noticed and elevated to a higher position.

As Ed brings out, if the foreman does not understand every mechanical detail under his supervision, who should? That applies especially to a smal shop or a toolroom. There are many jobs where a visual demonstration will do more good than words, which, of course, is doubly important when you are showing a new man or teaching an apprentice.

It is helpful when a foreman can step in and turn out work in a proficient manner, show the employee what is expected of him, and what can be done—also sometimes convincing himself that the job was rated too high or too low. It is a help for the foreman to keep his hand in, for it is surprising how soon one loses "the touch" when no longer working on the bench. It is easier by far to judge a man's work by what is finished at the end of the day rather than to watch to see if he is working or loafing, and a foreman cannot truthfully do this unless he has the actual experience.

A foreman should not do work that can be accomplished by someone else, but he should never refuse or hesitate to pitch in and help in a tough spot.

B. E. WESSINGER
Flushing, N. Y.

•

FRIEND — OR FOREMAN?

It is quite possible to be on intimate terms with certain of one's men and still be fair to all the men, but it is not an easy thing to do, and he who attempts it leaves himself open to the charge of favoritism. It is much easier and less dangerous to be on intimate terms with all of one's men by means of social functions at which all can be present, if they so desire. If, at such events, the foreman proves to be a good mixer, suspicions of favoritism don't arise, and promotions should then be free from taint.

Promotion of an employee over his shopmates is almost certain to be seized on by envious persons as an excuse for shouting "pet," but the wise foreman takes the sting out of such an insinuation beforehand if he makes his social contacts with the men general and all-embracing. It is also quite possible, if unwise, for a foreman to be on intimate social terms with some of his men, because some men are sensible enough to take the proper view of the friendship and, confining it to out-of-work hours, seek no business favors. But with other men who cannot refrain from parading the friendship before their shopmates, a bad shop atmosphere is created. They provide scope for the scoffers and troublemakers, and the wise foreman will perceive that prevention is cheaper than cure, and will go easy in the matter of shop friendships. Even in the case of men who give no sign of being on intimate terms with the foreman, such information is sure to reach the troublemakers, who lose no time in slinging it around, and it is bad generalship for the foreman to provide the material.

In thirty years of handling his fellowmen in several shops the writer has met many men from floor sweepers up whom he admired and respected, but for reasons so cogently stated by "Ed" has always re-

BIG BLANCHARD GRINDERS Mounted on UNISORB without BOLTS OR LAG SCREWS

Among the types of machinery which this company mounts on UNISORB are these big Blanchard Grinders. The nature of the flooring in this instance prohibited the old way of bolt or lag screw anchoring.

UNISORB is equally effective on conventional floors of all kinds. Special cement bonds UNISORB to the flooring surface with a holding strength of 1500 lbs. per square foot *minimum!*

In addition to the elimination of damage to floors and the installation savings in man hours, UNISORB absorbs from 60% to 85% of transmitted vibration and noise . . . saves on machine and building wear and repair . . . helps increase production by lowering worker fatigue through quieter surroundings.

These are but a few of the reasons why the trend of modern industry is to "Anchor it on UNISORB" — you can have the full story just by writing for it, so write — *today.* Ask for your copy of "Why it Pays to Anchor Your Machines with UNISORB."

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frained from satisfying his desire to cultivate their society, except at social functions where he could have a word with all present. As a consolation, however, change of employment has presented opportunities for deferred enjoyment when the writer made full use of his freedom to cultivate the society of those whom he liked and left in other shops.

W. D. Mackinnon
Lanarkshire, Scotland

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GUARDS OR PRODUCTION?

Most old-timers will recall the wet grindstone where the lathe hands ground their tools. When the stone ran dry, one took the wooden paddle and sloshed the water up from the tank underneath onto the under side of the stone. The tank usually gave forth a rich aroma in the summertime. They will also recollect that if you got a foreign body in the eye you groped your way up to big Axel in the toolroom, who was a hellion when it came to eyes. Yes, he was good, but once in a while he removed more than the foreign body, and his instruments weren't always completely sterile!

The oldtime lathe itself was a fruitful source of accident, with its cone pulleys and overhead belts. At the beginning of World War I a local journalist waxed lyrical about "the forest of belting"—the forest of belting and the hunk of timber one used to knock a tight belt up a step on the overhead cone, and the time lost in digging slivers from the more meaty portions of the human palm! I know an elderly gent who then, as an apprentice with more ambition than muscle, won undying fame for himself among his fellow-slaves by losing control of the belt-stick. He all but drove the old man's derby hat down over his ears!

There were the rickety ladders one climbed in fear and trembling to replace a drive belt on the whirling mainshaft pulley when the lathe stalled under a heavy cut. It was a major offense to stop the mainshaft unless at mealtime or quitting time. Of course, an exception was made in a case of absolute necessity—when one poor devil's jumper sleeve got caught and he went around with the shaft. There were those beautiful change gears at the rear of the lathe that one had to wrestle with if a fine feed was required or a thread had to be cut. How prolific of barked knuckles they were, not to mention profanity—and how inadequately guarded, if at all!

Who would exchange all those delights for a modern, individual motor-driven lathe with quick-change gear control and unheard of speeds and feeds at the flick of a finger? Just anyone in his right senses, Ed!

I think of oldtimers now gone to their reward and how they wrestled with those man-killing machine tools of yesteryear, in drafty, ill-lighted shops. Truly, there were giants in the land in those days. Yet one of those giants at the end of a gruelling ten-hour day would have been lucky to get out one-half of the work his present day vis-a-vis produces in eight hours with less than one-half the effort.

There were few safety men in those days of long ago, Ed, and quite a few competent men around, but what a staggering amount of lost-time accidents they piled up in proportion to the work they produced.

So it would be wise to cooperate with the safety man next time he comes around with a suggestion. You can have guards *and* production.

Robert S. Alexander
Greenville, R. I.

•

STEP DOWN OR STEP OUT?

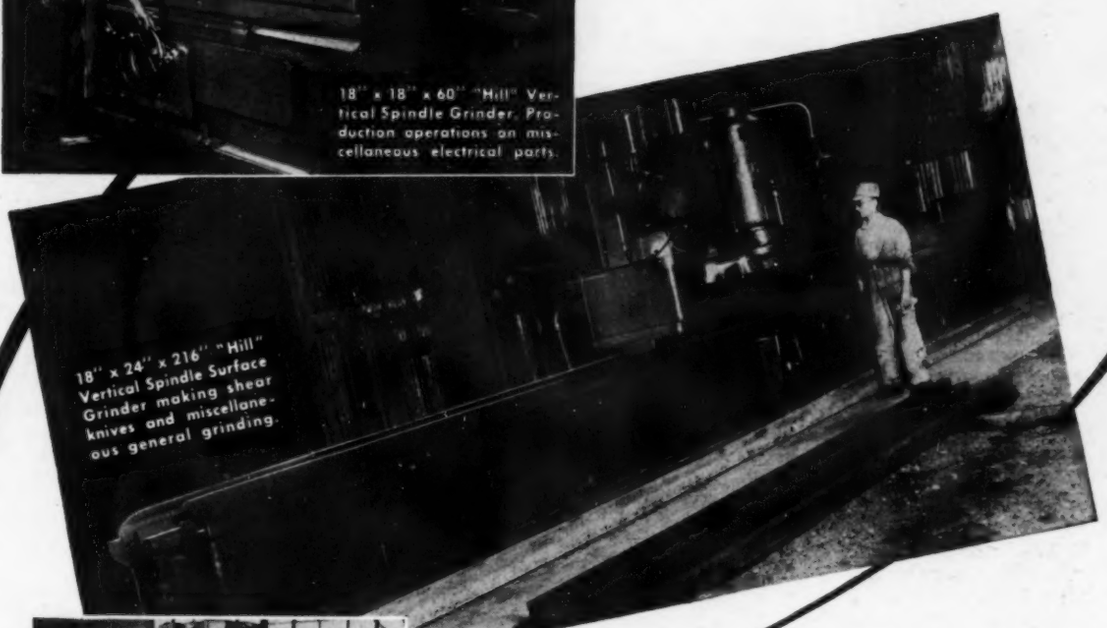
The problem of Mike being demoted is a real one in many shops, and the morale of the whole shop may be affected by the way it is handled. Years ago they used to offer a machinist who could no longer keep the pace a job as sweeper or as running an elevator, if the shop had one. Further down the line was being a night watchman. All of these leave a bad taste in the mouth of the older men in the shop, and do not breed loyalty to the firm.

The Packard Company had a plan which had some very good points. I'm not sure that it is still in use. When a man could no longer stand the pace of the production line but had given good service, they put him on other work where his skill could be utilized, sometimes in a special department. If he could not earn as much as he had been getting in the production department, they made the difference between what he really earned and his old rate, from a sort of pre-pension fund. This saved his face and gave the company his production as well as the benefit of his experience in one of several lines. Some plan of this kind should prove profitable in building morale in a shop. Dumping a good man when he gets beyond the age for maximum production does not encourage good men to enter the trade.

Henry C. Francis
Tampa, Fla.

A WIDE VARIETY

18" x 18" x 60" "Hill" Vertical Spindle Grinder. Production operations on miscellaneous electrical parts.



18" x 24" x 216" "Hill" Vertical Spindle Surface Grinder making shear knives and miscellaneous general grinding.

24" x 24" x 60" "Hill" Horizontal Spindle Surface Grinder Precision grinding on tool and dies.

24" x 24" x 72" "Hill" Horizontal Spindle Surface Grinder, processing steel dies, shear blades and miscellaneous.

Extensive variation of grinding operations is everyday work for HILL Open Side Hydraulic Surface Grinders.

Accompanying illustrations give concrete evidence of the wide range of applications, so that *always* the *correct type of machine* can be recommended for the specific job to insure most efficient and most economical operations.

Normal applications for HILL Vertical Spindle Grinders are heavy stock removal on flat surfaces, with accuracy and speed. Normal applications for HILL Horizontal Spindle Grinders embrace grinding of flat, angular, irregular and special shaped surfaces, where a fine finish and extreme tolerance is required. Both types are built in a wide range of table widths and lengths to meet individual needs.

THE HILL ACME COMPANY

6400 BREAKWATER AVENUE • CLEVELAND 2, OHIO

"HILL" GRINDING AND POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

Names in the News

Stanwood W. Sparrow

Stanwood W. Sparrow has been elected vice president in charge of engineering at The Studebaker Corp., South Bend, Ind. Mr. Sparrow succeeeds **Ray E. Cole,** who is retiring. He joined Studebaker in 1926 and 11 years later was named chief of research and development.

Benson Ford has been elected a vice president of the Ford Motor Co., and a director of the Lincoln-Mercury Div., with which he has been associated since last October.

Maurice J. Hoke has been appointed works manager of the crankshaft and camshaft divisions of the Ohio Crankshaft Co., Cleveland, while **Alfred H. Schott** has been promoted to the position of master mechanic for the firm.

Ralph L. Wilcox has been elected vice president in charge of industrial sales and engineering of the Gerity-Michigan Corp., Adrian, Mich.

James M. White, vice president in charge of manufacturing at Allis-Chalmers Mfg. Co., Milwaukee, has resigned but will remain in an advisory capacity for six months.

Frank A. Learman, manager of the company's San Diego, Calif., plant, has been elected a vice president of Consolidated Vultee Aircraft Corp., while **Frank W. Fink** has been appointed chief engineer of the plant.

Daniel D. Strohmeier has been named vice president in charge of shipbuilding of the Bethlehem Steel Co., to succeed the late **W. H. Collins.**

G. F. Clipsham has been appointed assistant to the president of The Lincoln Electric Co., Cleveland. He was president of the British Lincoln firm for 12 years.

L. D. Gable, factory manager of the Columbus plant for the last three years, has been named general manager of that Timken Roller Bearing Co. plant. He succeeds **William A. Fowler,** who has retired.

Frank M. Mason has been appointed vice president in charge of the Atlantic plant in Milford, Conn., of U.S. Electrical Motors, Inc.

L. A. Young, Jr. has been elected president and **Norbert H. Wiesler,** executive vice president, of Bowen Products Corp., Ecorse, Mich., and Auburn, N. Y.

Walter D. Appel, former chief engineer, has been appointed director of purchasing for Willys-Overland Motors, Toledo, Ohio.

Theodore I. Leston

Theodore I. Leston has been appointed vice president in charge of production for Eutectic Welding Alloys Corp., New York.

William Townsend has been appointed general sales manager of the Pennsylvania Flexible Metallic Tubing Co., Philadelphia, while **Edward Sala** has been named manager of the firm's mid-west branch in Chicago.

Farrel B. Weber has been named sales manager of the Micromatic Hone Corp., Detroit. He had been with Micromatic for three years and was previously associated with Westinghouse Electric Corp.

Edward J. Bond has been named manager of Ford Motor Co's. Lincoln-Mercury assembly plant in Los Angeles, succeeding **A. R. Davis.**

Lloyd R. Cooper has been named director of research for the Heppenstall Co., Pittsburgh.

J. Albert Robinson has been named purchasing agent for the Standard Tube Co., Detroit.

The four new vice presidents elected by Air Reduction Pacific Co. are **L. A. Hamilton** in Seattle, **E. W. MacCorkle, Jr.,** for Portland, **H. W. Saunders** in San Francisco and **H. A. Hoth** in the Los Angeles district.

Charles F. Kennedy, former vice president and secretary, has been elected president and treasurer of the Kennedy Valve Manufacturing Co., Elmira, N. Y.

E. B. Maire has been appointed sales manager of the eight branch offices of General Controls Co., Glendale, Calif., in Boston, Philadelphia, Pittsburgh, Birmingham, New York, Detroit, Cleveland and Chicago.

R. G. Morey and **Roy Nesbitt** have been appointed to represent the Quincy Compressor Co., Quincy, Ill., in the North and South Atlantic states, respectively.

Williard R. Gates has been appointed representative of The Wheel Trueing Tool Co., Detroit, in western Michigan, succeeding the late **George F. W. Reid.**

Walter D. Abbott has been appointed representative for the Edward Blake Co., in eastern Massachusetts, Rhode Island, Maine and part of New Hampshire. Also, **John Leafstrom** will represent the company in eastern Pennsylvania and southern New Jersey.

Edgar H. Krainer

Edgar H. Krainer has been named chief engineer of the U.S. Broach Co., Detroit. He replaces **Randall L. Kamischke,** who was recently appointed New York representative.

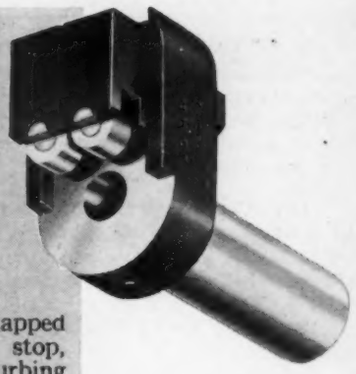
TWO *New* SCREW MACHINE TOOLS

MODEL AT
Non-Releasing Adjustable TAP HOLDER

Correct alignment of taps between turret and work spindle is quickly possible with this new Tool. Simply set and tighten two screws. Permits adjustment of as much as $\frac{1}{16}$" for any misalignment in machine. Moving parts enclosed. Smooth running and long wearing. In 3 Sizes.

MODEL RR
ROLLER REST

A Tool to replace the old fashioned solid support. Eliminates marring of piece parts and wear that causes variation in diameters. Adjustable rollers permit closer tolerances over long runs. Shank is tapped to permit adjustment of stop, drill or reamer without disturbing set-up of tool. In 2 Sizes.

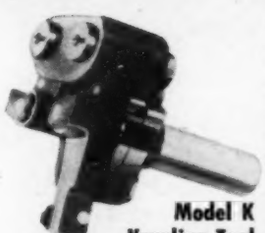


BOYAR-SCHULTZ

SCREW MACHINE TOOLS for Full Time Production of Quality Piece Parts

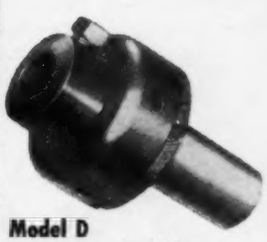
Your screw machines are geared to maximum production only when equipped with Screw Machine Tools that can bring out FULL production possibilities. And FULL production also includes accuracy that insures a minimum of rejects.

It is with this in mind that all Boyar-Schultz Screw Machine Tools are designed. They are made from the finest materials with expert workmanship and incorporate many outstanding features that assure high precision production.



Model K Knurling Tool

Designed to operate from the turret for difficult knurling operations behind and between shoulders. In 3 Sizes.

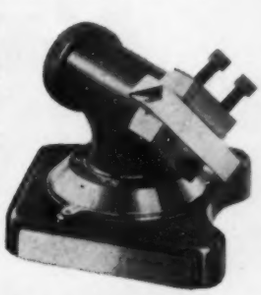


Model D Floating Tool Holder

For very accurate reaming. Full floating feature corrects misalignment that so often occurs between tool and work. Made in 8 Sizes.

Model DRH Adjustable Drill and Reamer Holder

A precision made Tool designed for easy adjustment and saving in set-up time. Resists strains and impact. In 3 Sizes.



Model G Universal Tool Bit Grinding Fixture

For grinding screw machine tool bits with precision exactness. Any particular grind can be duplicated singly or in quantity.

BOYAR-SCHULTZ CORPORATION

2109 WALNUT STREET • CHICAGO 12, ILLINOIS

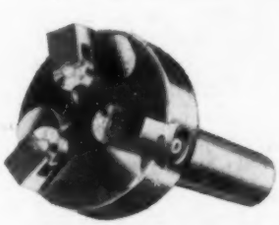
Write for Complete Catalog

MODEL T Turning Tool

Designed for very close tolerance work and made with built-in strength that holds adjustments through long runs. In 7 Sizes.

Model RS Revolving Stop

Quality made with a free turning head. Gives greater uniformity in piece part lengths. Prevents marring of parts. In 3 Sizes and 7 lengths.



Model C Burnishing Tool

For producing a finish smoother than the usual machined surface. In 3 Sizes.

Call at Our Exhibit—**BOOTH 713 . . . ASTE SHOW . . . CLEVELAND**

Business Items

R. K. LeBlond Machine Tool Co., Cincinnati, has opened a direct sales and service office in the New Center Bldg., Detroit, covering the state of Michigan. **Oscar P. Noe** is in charge of the office.

The Cleveland Graphite Bronze Co. has grouped its manufacturing operations in heavy-duty types of engine bearings into a separate unit. **M. J. Merlin** is manager of the new unit, while **C. E. Wilcox** is master mechanic.

The Reed Roller Bit Co., Houston, Texas, has entered the pneumatic tool industry with the formation of **The Cleco Div.** for the manufacture and world-wide distribution of rotary and reciprocating pneumatic tools. **W. J. Vossbrinck** has been appointed sales manager of the new division.

Link-Belt Co., Chicago, has moved its Pittsburgh district sales office to the former McKay residence at 5020 Centre Ave. where new office and factory-branch store buildings will be erected eventually to replace the residence.

Universal-Cyclops Steel Corp., Titusville, Pa., will construct three steel buildings, costing $300,000 and including a two-stand 14-in. rolling mill.

Sealed Power Corp., Muskegon, Mich., will erect a $2,000,000 foundry in Ionia this spring for the production of castings for piston rings.

The Wilson Welder & Metals Co., Inc., New York, has appointed the **Industrial Air Products Co.,** 3200 N.W. Yeon Ave., Portland, as its exclusive electrode distributor in Oregon.

Central Screw Co., Chicago, has acquired the plants of the **New England Screw Co.,** Keene, N.H.

John Bath Co., Worcester, Mass., has appointed **L. C. Pensinger & Son,** 1609 Oak St., Kansas City, Mo., as its distributor in Kansas and western Missouri.

The Metal & Alloys Specialties Co., Buffalo, has been purchased by **Joseph P. Bauer** and **Lester Benson.** The two men will be president and vice president-treasurer, respectively, of the firm.

Borg-Warner International Corp., Chicago, has formed an **Industrial and Utility Section,** with headquarters at 321 W. Lafayette Ave., Detroit. **Claude Pitts,** formerly general product manager of the Appliance Section, heads the new unit.

The Union Manufacturing Co., New Britain, Conn., has acquired the Hannifin air chuck and cylinder business from the **Hannifin Corp.,** Chicago.

Clarke H. Joy Co., Cleveland, has been formed by **Clarke H. Joy,** former district manager of Wheelco Instrument Co. The new firm, which will continue the distribution of Wheelco products, will also have a service department.

Detroit Broach Co., has appointed **A. R. Shevlin Co.,** Park Square Bldg., Boston, as its representative in Maine, Vermont, New Hampshire, Rhode Island, Massachusetts and part of Connecticut.

The Bignall & Keeler Machine Works, Edwardsville, Ill., has been sold to the **John Ramming Machine Co.,** St. Louis. Operations will be transferred to St. Louis as soon as possible.

Camcar Products Co., Rockford, Ill., is operating its new plant manufacturing special and standard screw products.

Schweizer Aircraft Corp. has purchased from WAA its Elmira, N. Y. plant for $110,000.

Deltec, Inc., newly organized Youngstown, Ohio, firm, has entered the precision machine and die field, specializing in making aluminum dies for aluminum extrusion and stamping work.

Nichols Wire & Steel Co., Davenport, Iowa, has changed its name to **Nichols Wire & Aluminum Co.**

G & C Foundry Co., Sandusky, Ohio, plans to construct an addition to the foundry for the production of grey iron semi-steel castings.

Corbin Screw Division of **The American Hardware Corp.,** New Britain, Conn., has moved its New York showroom and office to the Hudson-Charlton Bldg., 333 Hudson St.

Robert H. Clark Co., Beverly Hills, Calif., has named the **Walter E. Winfrey Co.,** Cambridge, Mass., as its representative in Maine, New Hampshire, Rhode Island and eastern Massachusetts.

The Ashland Steel Products Co. has been incorporated as a subsidiary of the **Union Malleable Mfg. Co.,** Ashland, Ohio.

Step Up Output of Precision Parts

SHAPE-RITE
8" Stroke Hy-Duty Model
SHAPER

Highly recommended for stepping-up output of precision parts by tool and die makers, small instrument manufacturers, and those who machine small parts either for production or repairs to machinery.

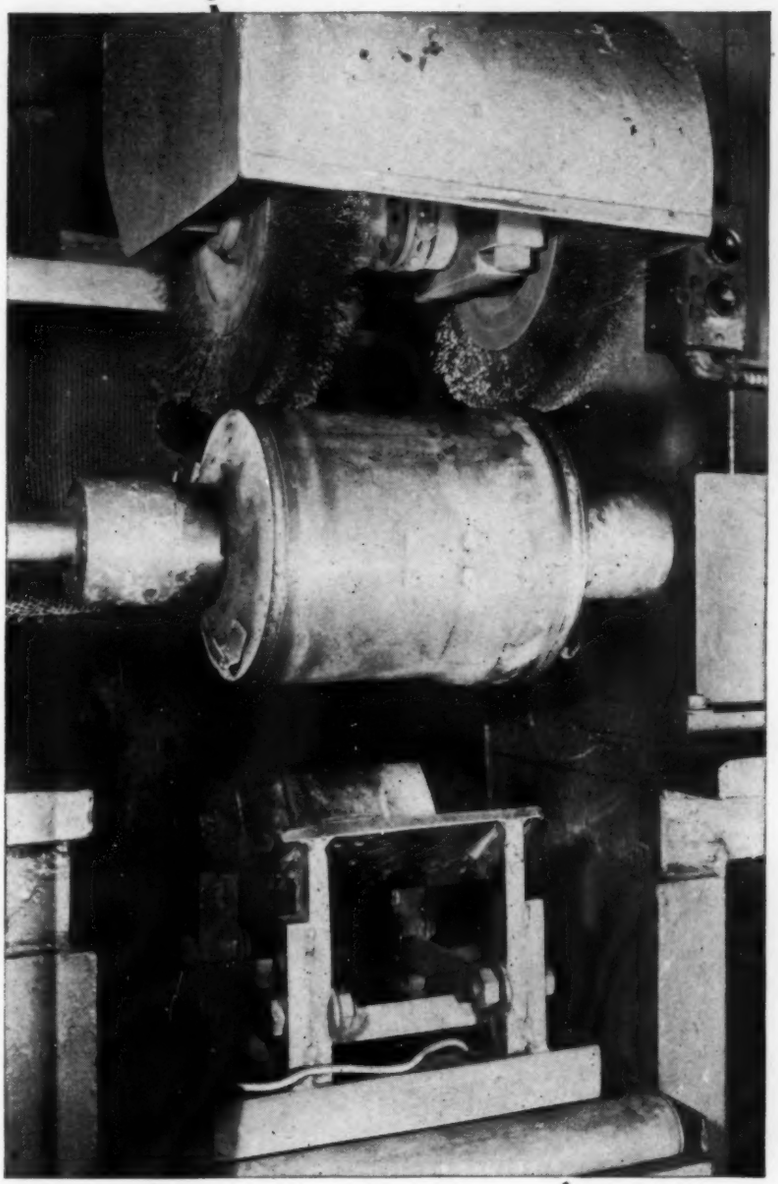
- **BUILT-IN ACCURACY** assures fine finishes and precision parts that are right. Helical gears eliminate gear tooth reproductions on your work.
- **INCREASES OUTPUT** from each operator by providing speedier set-ups, and faster machining. Four operating speeds for wide range.
- **SAVES MONEY** by increased production and by elimination of many costly fixtures. SHAPE-RITE Shapers are furnished with plain or swivel tables.
- **THOROUGHLY DEPENDABLE** to give continuous full capacity service. Heavy duty construction PLUS outstanding design features.

See your local dealer or write Dept. 58 for FREE bulletin and prices.

Sales Service Machine Tool Co.
2363 UNIVERSITY AVE. ST. PAUL 4, MINNESOTA

OSBORN BRUSHES

WHISK AWAY WELD SCALE IN 40 SECONDS



Automatic brushing operation processes refrigerator compressor heads in record time.

IT'S a production job—cleaning weld scale from both ends of a refrigerator compressor head. It's an important job—trouble free, precision performance demands that every trace of this scale be removed.

Here's how it's done—fast, economically, thoroughly—in 40 seconds. The compressor head is first attached to a rotating fixture. Then two power driven Osborn Master Wire Wheel Brushes are lowered automatically into just the proper brushing position. Head revolves, wheels revolve and in 40 seconds a unit free from all weld scale is on its way to the next assembly station.

Simple? Sure. Just a matter of combining a little ingenuity with the right type of brush and the savings are all yours. Modern power brushing is piling up profits on dozens of jobs—cleaning, roughing, removing burrs, finishing, polishing.

Osborn's 56 years experience means more than just "know how" in building better brushes. There's a wealth of practical application ideas that are yours for the asking. An Osborn sales engineer will be glad to show you why brushes are one of today's most modern production tools. Write or call—

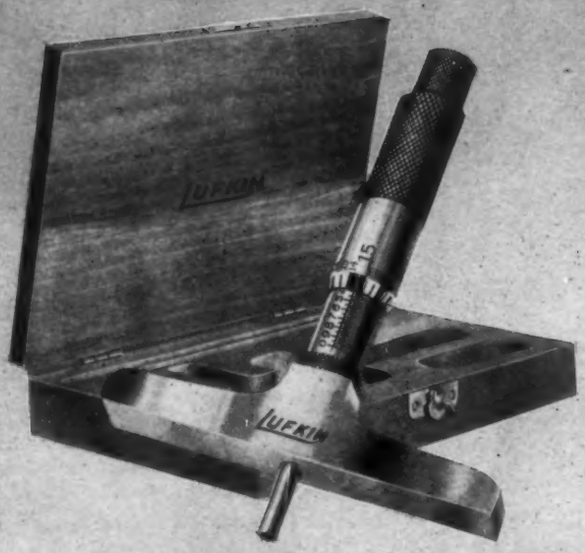
THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue Cleveland, Ohio

Osborn Brushes

WORLD'S LARGEST MANUFACTURERS OF BRUSHES FOR INDUSTRY
POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES

LUFKIN MICROMETER
DEPTH GAGE



ACCURATE

EASY TO USE

For easy, accurate depth measuring of finished holes, keyways, and slots, toolmakers prefer Lufkin Micrometer Depth Gages. Hardened and ground base, 3" or 5" long, sits firmly without rocking. Interchangeable rods for 0 to 3" measuring have hardened and lapped ends, and are equipped with adjusting nut to compensate for wear. Knurled surface at top of both sides of head assures firm grip. Exclusive!—only Lufkin Micrometer Depth Gages have patented lock nut that maintains reading. For free catalog write THE LUFKIN RULE CO., SAGINAW, MICH., New York City.

BUY THROUGH YOUR DISTRIBUTOR

LUFKIN FOR ACCURACY

Central Industries, Ltd., exporters and importers, New York, have been appointed exclusive distributors of **A/B Fr. Ramström,** Swedish manufacturers of RAMIT precision metalworking machinery. Frank Sande has been placed in charge of setting up agencies in U.S. and Canada.

The Columbus Bolt & Forging Co., Columbus, Ohio, has purchased the interests of **Beale E. Post,** chairman, in **The Columbus Bolt Works.**

Ohio Nut & Bolt Co., Berea, Ohio, is seeking a location for a new plant and expects to spend more than $50,000 this year for expansion.

F. J. Havey Machinery Co., has changed its name to **Havey-Legg Machinery Co.** and moved to 15841 Schoolcraft, Detroit.

The Watson-Stillman Co., Roselle, N. J., has appointed two new agents for California. Plastics and rubber molding equipment sales south of Monterey, Fresno and Tulare counties are being handled by **H. M. Royal, Inc.,** 48-14 Loma Vista Ave., Los Angeles. Hydraulic machinery sales north of the counties of San Luis Obispo, Kings and Tulare go to **Schellenbach Machine & Tool Co.,** 480 Fifth Ave., San Francisco.

Acme Tool Co., New York, has named **Walter E. Winfrey Co.,** Cambridge, Mass., as its representative in eastern Massachusetts, Rhode Island, New Hampshire and Maine.

Chase Iron & Forge Co., Bridgeport, Conn., has acquired the property formerly owned by **Silliman & Godfrey** and will move into its new quarters after alterations have been completed.

Essex Wire Corp. of California, has leased a former Navy warehouse as a branch plant in San Diego for the manufacture of automotive ignition system assemblies.

MEETINGS

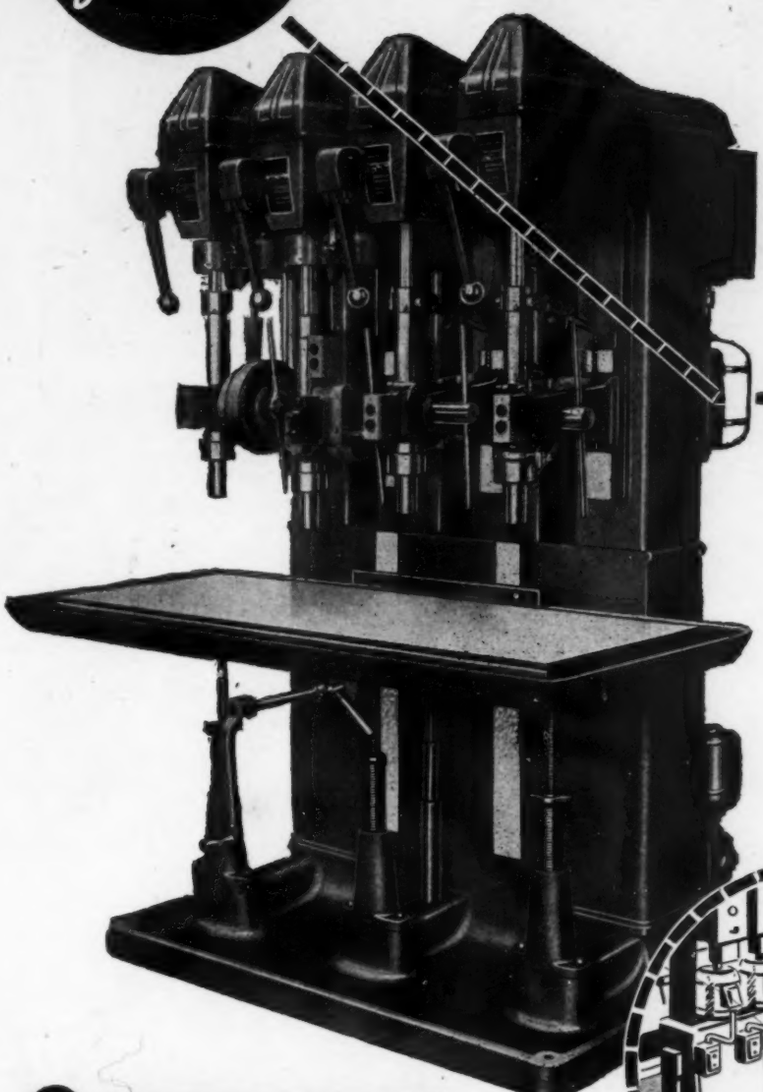
American Society of Mechanical Engineers. Spring meeting. St. Charles Hotel, New Orleans, La. March 1-4. Ernest Hartford, executive assistant secretary, 20 W. 39 St., New York.

American Society of Tool Engineers. Sixth annual industrial exposition. Public Auditorium, Cleveland. March 15-19. J. M. Cannon, director of public relations, 1666 Penobscot Bldg., Detroit 26.

Westinghouse Machine Tool Forum. Hotel Statler, Buffalo, N. Y. April 22-23.

Avey's PLUS features add up to TOP PRODUCTION

Each spindle of AVEY BMA-6 is individually motor-driven by standard frame constant speed motor. Foot-mounted motor easily interchanged or replaced. Standard motors can be stocked.



AVEY TYPE BMA-6

Four Spindle—12" Overhang

1st spindle—Avey-matic feed
2nd spindle—Plain power feed
3rd spindle—Hand feed
4th spindle—Tapping (reversing motor)

Single to six spindle machines, equipped with hand feed, power feed or reversing motor tapping.

plus FINAL SPINDLE DRIVE—VEE BELTS

Vee belt used on final drive from gear box to spindle. Increases speed and sensitivity in drilling. Carries full horse power from motor to job.

plus SIX SPEED CHANGES

On the AVEY BMA-6 six speed changes are made through selective, sliding gears. This automotive type of gear shift is controlled by a single lever at front of machine. Provides versatility and effective operation.

plus SPEEDS OBTAINED — SLIDING GEARS

Selective, sliding gears of AVEY BMA-6 change speeds quickly and easily. Each gear is manufactured and finished by accurate, modern process, shaved, hardened and lapped. Insures smooth operation and long performance.

Avey DRILLING MACHINES
CINCINNATI, OHIO

CLIP AND MAIL TODAY

AVEY DRILLING MACHINE CO.,
CINCINNATI 1, OHIO 1

Gentlemen: Please send without obligation your new Bulletin 647.

COMPANY_____

ADDRESS_____

NAME_____

"KEX" *Industrial Wiping* TOWELS

...More Important Every Day to the *AMERICAN INDUSTRIAL SCENE*

[Here—the Press Room, Chicago Sun and Times]

This important newspaper, as well as many other leading papers have found KEX Industrial Wiping Towels "made to order" for important wiping needs.

The reason—KEX Industrial Wiping Towels are produced especially for wiping. They are soft, with no harsh seams, no hidden buttons to mar delicate surfaces.

Every wiping towel is thoroughly cleaned and inspected before delivery to you. They come in neat, easily stored bundles that help you control distribution.

Follow the lead of industrial leaders who overlook no opportunity to keep operating costs down—and efficiency up.

Nothing to Buy—No Expensive Inventory—Just a Low Monthly Rental. The first month should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX NATIONAL SERVICE, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF. "KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

OBITUARIES

Albert H. Chatley

Albert H. Chatley, 55, a vice president and the general manager of the Delta Manufacturing Div., Rockwell Manufacturing Co., Milwaukee, died Jan. 24. He had been with Delta for the past nine years. He formerly was secretary-treasurer of the Wisconsin Axle Co., Oshkosh, Wis.

Arthur M. Morgan, 58, former vice president of the Latrobe Electric Steel Co. died Jan. 26.

Paul W. Cotton, 67, who retired in 1946 as vice president of Bethlehem Pacific Coast Steel Corp., died Jan. 13.

Morgan R. Kavanagh, factory manager of Ohio Crankshaft, Inc., crankshaft and camshaft divisions, died recently.

Charles A. Olson, 67, tool superintendent at the Gisholt Machine Co., Madison, Wis., died after a short illness on Jan. 3.

Charles J. Borg, 72, president-treasurer of the International Tool & Gauge Co., Bridgeport, Conn., died Jan. 21. He was one of the founders of the firm and later purchased complete control of the business.

Mary Jane LeCount, 82, who succeeded her husband as head of the W. G. LeCount Tool Works, Norwalk, Conn., died suddenly Jan. 15.

Richard Kast, 79, president of the Kast Copper & Sheer Iron Co., Buffalo, for over 50 years who retired a year ago, died Feb. 2.

Dr. E. Roy Alling, 59, president of Rice & Adams Corp., Buffalo, for 20 years, died suddenly Feb. 1.

* This Pair is prepared for "Better or Worse"

THESE are power take-off gears. Will they be called upon to idle along on easy jobs? Or will they be required to hit sustained top speeds under heavy gruelling loads? Who knows? With applications so varied in both industrial and agricultural fields they must be prepared for "better or worse"—designed and built to standards that anticipate the hardest possible service.

IN ALL LIKELIHOOD the gears you use are expected to bear unusual loads or stand up under adverse operating conditions. When you have established ultimate load capacity, either in your own plant or with the aid of our engineers, you get Double Diamond Gears that *meet or exceed those specifications.* And that goes for every other requirement as well—speed, service life, quietness, tolerances, and the rest. In brief, you get the only kind of gears we care to make—gears in every way worthy of the Double Diamond trade-mark.

Another point worth your consideration: We've been making "Double Diamonds" for more than twenty-five years. That's of great importance in a business where yesterday's experience so often solves tomorrow's problems. If we can serve you, write.

DOUBLE DIAMOND
TRADE MARK
GEARS

Made by
Automotive Gear Works, Inc.
RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

TWO GREAT NAMES...DODGE-TIMKEN!

It was Dodge who took the famous Timken Bearing, mounted it, sealed it, housed it and delivered a pillow block of new high quality—fully assembled, ready to lock on the shaft and carry the power loads of industry with new efficiency.

Dodge develops *outstanding* power transmission products, as proved by the big success of Dodge-Timken Bearings on millions of industry's toughest jobs.

Dodge-Timken Bearings are supplied promptly from stock in four basic types and a wide range of sizes to meet an almost limitless variety of anti-friction problems.

Dodge also produces Ball Bearing Pillow Blocks which, with Dodge-Timken Bearings, comprise the famous "30,000 hour line." Write for complete bulletins.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER

He is your local Dodge Distributor—factory trained—qualified to suggest ways to improve your machine performance, increase production. Look for his name under "Power Transmission Equipment" in your classified phone book.

Copyright, 1948, Dodge Mfg. Corp.

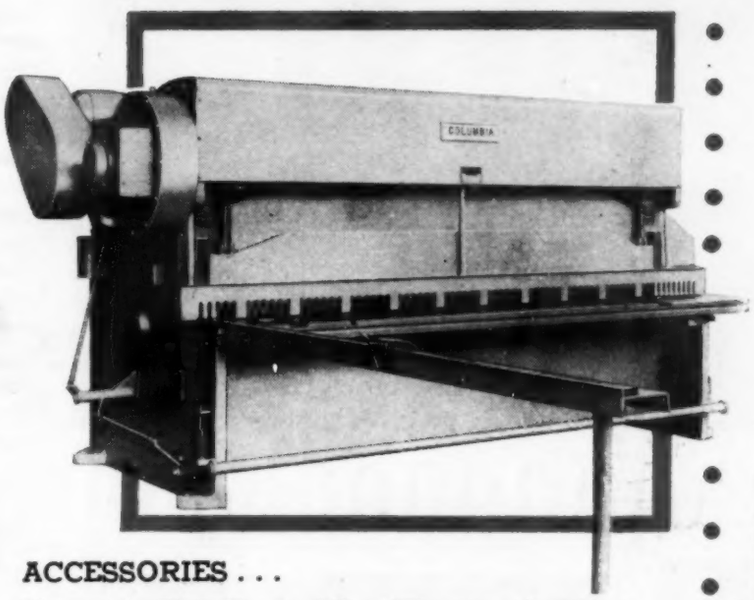
NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

YOU NEED **all** THESE

ADVANCED DESIGN FEATURES

TO MEET TODAY'S PRODUCTION PROBLEMS



Columbia

STEEL SQUARING SHEARS

DELIVERY WITHIN 30 DAYS

ACCESSORIES . . .

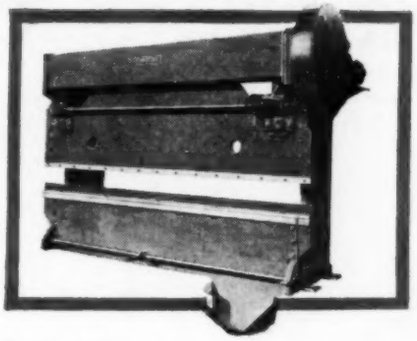
Micrometer Back Gauge, 24" or 36" range, adjustable in sixty-fourth inches. Provision for taper shearing. Front or back operation.

Squaring Arm of ten-foot-range, with steel scale and adjustable folding gauge finger, for use on either end of the shear.

Front Gauge with 50" range.

- **LONGER SHEAR BLADES** than are normally required for cutting full width of material eliminate tearing or nicking when notching or trimming sheets longer than blades.
- **ADJUSTABLE UPPER BLADE HOLDER** has a heavy brace with provision for readily adjusting horizontal alignment of blade.
- **RIGID STEEL CONSTRUCTION** of the base, housing, table, slide, top cross tie, etc., for maximum strength, durability and precision.
- **GEARS OPERATE IN OIL.** Steel gears, precision machine cut, operate in an oil-tight case.
- **SOLID, POSITIVE CLUTCH** has six alloy-steel jaws with hardened faces. Automatic stop cam.
- **HEAT-TREATED, FORGED ECCENTRIC SHAFT** — eccentrics forged integral with shaft.
- **MECHANICALLY-OPERATED AUTOMATIC HOLD-DOWN** has individual high-compression spring compensating fingers, insuring unfailing operation.
- **STAINLESS STEEL SCALES.** Non-rusting, easily-read.
- **CENTRALIZED LUBRICATION** for adequate, dependable lubrication to main bearings.
- **FINGER GUARD** in front of the shear blades.
- **CAPACITY.** 10 and 12 foot models will shear 3/16" mild steel at 60 strokes per minute. Six-foot models will shear 1/4" mild steel at same speed. Standard throat depth, 18 inches.

POWER PRESS BRAKES



Columbia Power Press Brakes, for forming mild steel, 4 to 10 feet, in 3/16" to 7/16" gauges, offer many cost-cutting advantages.

Write for Bulletins

COLUMBIA MACHINERY AND ENGINEERING CORPORATION

HAMILTON, OHIO

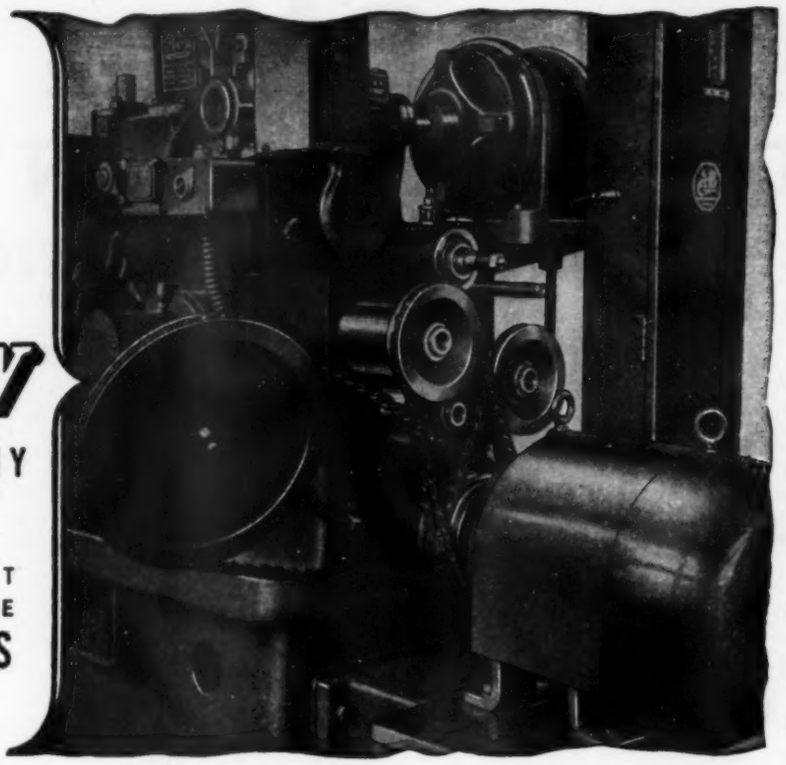
Goss & DeLeeuw

MACHINE COMPANY

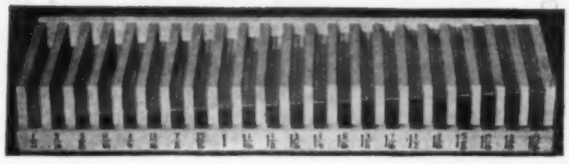
KENSINGTON · CONN.

★

THE WORLD'S FINEST
MULTIPLE SPINDLE
CHUCKING MACHINES



ANTON PARALLELS



Increase Production . . .
Improve Quality . . .
Use ANTON PARALLELS
they fill a long-felt need

Parallels used in grinding operation.

Anton Parallels can be used profitably in any shop because they have wide utility and are moderately priced. They are guaranteed to come within the following specified limits of accuracy: .001" in size; .0001" in parallelism and straightness within length. Rockwell "C" hardness: 65 up.

These gages can be depended on for permanent straightness and accuracy.

Anton Parallels come in 79 standard sizes:

¼" thick x 6" long, ½" to 1-13/16" High in Steps of 1/16" Price $96.00 per set

½" thick x 6" long, 1-3/16" to 1-13/16" High in Steps of 1/16" Price $71.00 per set

¾" thick x 6" long, 1-3/16" to 1-13/16" High in Steps of 1/16" Price $88.75 per set

Each set includes a handy wooden container. Single pairs also available from stock. All prices F.O.B. New York.

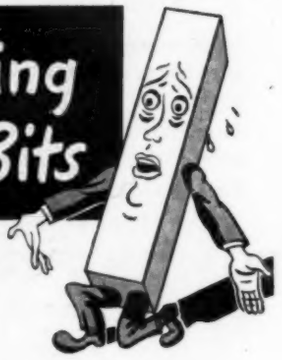
ANTON MACHINE WORKS

52 SANDS STREET **BROOKLYN, N. Y.**

Sales Representatives

Toolskill Co., 55 E. Washington St., Chicago 2, Ill.
Eastern Machine & Tool Co., 170 Broadway, New York 7, N. Y.

Stop Abusing Your Tool Bits



Change Now to Clark Adjustable Tool Holder with Vise-Grip Jaw

Users say: The first real tool holder improvement in 25 years!
Exclusive vise-grip jaw eliminates rocking, because it exerts equalized pressure over *full* length of cutter channel, and not just at one point. Screw-operated jaw runs right to cutting edge and hugs bit so it can't slip, can't sag, can't break!

Holds All Sizes and Shapes
One Clark Adjustable Tool Holder takes 4 or more sizes of square, undersize round or out-of-round, or narrow tool bits for cutting-off or special forming operations. Short bits and stub ends may now be used up.

For Carbide Tools and Boring Bars
In addition to Standard Clark Adjustable Tool Holder with 15° cutter channel, there's the Clark Parallel Tool Holder for better seating and better clamping action on carbide bits, threading tools, and boring bars.

For complete information about Clark Adjustable Tool Holder, call your Clark Cutter Jobber today, or write for catalog **KE-2.**

SPECIFICATIONS		
MODEL	SIZE	TOOL CAPACITY
60	0	1/8 to 5/16
61	1	3/16 to 3/8
62	2	1/4 to 1/2
64	4	5/16 to 5/8

With 15° or parallel cutter channel either left or right hand.

CLARK CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BLVD. · BEVERLY HILLS, CALIFORNIA

Call in Continental

THEY HAVE THE "KNOW HOW" AND THE FACILITIES TO DESIGN SPECIAL CUTTING TOOLS TO FIT THE JOB

CONTINENTAL engineers and toolmakers have been designing and manufacturing special cutting tools to customers' specifications for nearly thirty years. With engineering "know-how", complete heat treating facilities, modern machine tools, both standard and special, and skilled operators . . . all under one roof and one management . . . CONTINENTAL is exceptionally well equipped to handle special cutting tool orders. For instance, form relieved cutters, either ground or unground, as illustrated here, can be made to your specifications quickly and accurately. Why not send a tool print, or a part print with information on production requirements to CONTINENTAL TOOL WORKS a division of Ex-Cell-O? You'll find prices reasonable and delivery prompt.

Group of form relieved milling cutters—typical of many special cutting tools designed and manufactured by Continental Tool Works, Detroit 6, Mich.

49—2

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

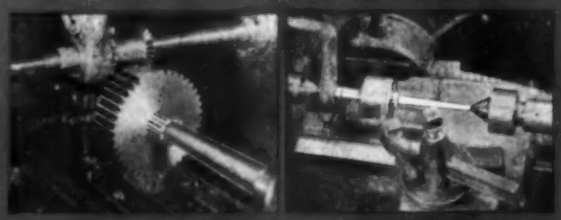
"KNOCK-OUT"

Expanding Mandrels

FOR TURNING—
GRINDING—
MILLING

This faster—simpler expanding mandrel speeds production on all types of operation. Sleeve provides maximum bearing surface for positive holding of work without distortion or marring.

Ask your nearest Mill Supply House or Mail the coupon TODAY.



Typical precision operations using "K-O" Expanding Mandrels

K. O. LEE CO. ABERDEEN, SO. DAKOTA

K. O. Lee Company
1111 First Ave. S. E., Aberdeen, So. Dak.

Please send us your illustrated bulletin on "K-O" Expanding Mandrels.

Name_____

Address_____

City_____ State_____

KUX

EXPERTS AT

CAM

CUTTING and GRINDING

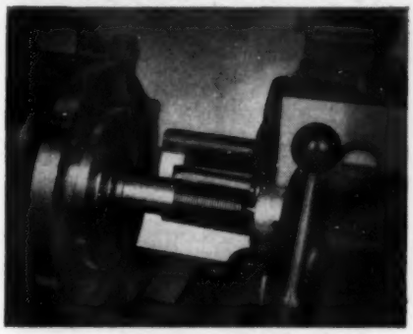
The largest, most completely equipped plant in the country devoted to CAM cutting and grinding is at your service. 25 YEARS of experience in making special cams for thousands of companies has made us experts at cam cutting and grinding. Our facilities and equipment, finest in the country, permit us to manufacture any style or size Cam, Geneva Motion or Scroll Plate in quantities of 1, 10 or 10,000. Accuracy can be maintained to split thousandths, and surfaces to micro-finishes. Send us specifications or blueprints and we will be glad to submit a detailed quotation on your requirements.

KUX MACHINE COMPANY

3924 WEST HARRISON STREET • CHICAGO 24, ILLINOIS

The Work Head Drive Governs Entire Automatic Cycle of Machine

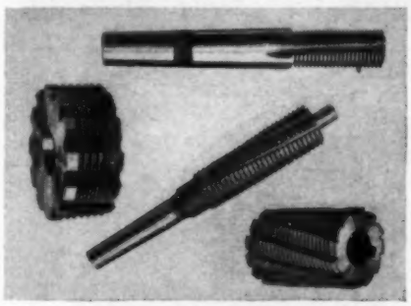
A feature vital to machine operation, the work head drive rotates work spindle from which longitudinal and transverse cams are driven



through gearing. Provides feeds and rapid traverse, controlled by dogs from conveniently-located dog-wheel.

Accuracy of Cutter vital To Precision Threading

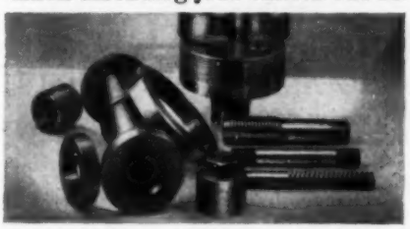
Hanson-Whitney Multiple Cutters, "finished" after hardening, hold spacing, form and relief to close limits. That is your assurance



of accurate, dependable thread milling . . . of long cutter life.

Examples of Threads Produced on 8" x 16" Model

Just a few examples of the precision threading jobs turned out on



this machine. Widely adaptable, the 8" x 16" H-W Thread Miller has external capacity of 8" diameter with 2½" cutter; internal capacity, 8" maximum diameter with 2½" cutter; 1" minimum diameter with 7/16" cutter.

HANSON-WHITNEY

FAST... ACCURATE... FLEXIBLE

SEMI-AUTOMATIC
THREAD MILLING MACHINES

Results tell the story . . . more accurate threading on an economical high speed basis! Hanson-Whitney Thread Millers assure the automatic production of perfect threads, eliminate costly spoilage . . . meet the demand for closer limits. Widely adaptable for straight or taper threads . . . internal or external . . . right or left hand. Multiple cutters finish threads in one revolution of work. Available in three sizes to answer diversified capacity requirements.

HANSON-WHITNEY MACHINE CO. HARTFORD 1, CONN.
Division of Whitney-Hanson Industries, Inc.

Write today for complete details that will help solve your thread production problem.

Hanson Whitney
PIONEERS OF FINISHED TAPS

Proof of LOWER PRODUCTION COSTS

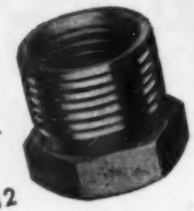
with REED Triple-Die *Precision Thread Rolling!*

1100 PIECES AN HOUR

Part: CAMBER ADJUSTING NUT

Operation: 1⅛" - 11 SPECIAL ANNULAR GROOVES

Material: SAE 1112 STEEL



Rolled on the REED Cylindrical-Die THREAD ROLLER Model A22

For complete specifications, write for Bulletin A22-1.

Prove it to your own satisfaction! Send us specifications of your work and let us roll samples. We will furnish production estimates and equipment costs.

REED A22
for
THREADING
•
KNURLING
•
FORMING
•
BURNISHING
•
SERRATING

REED ROLLED THREAD DIE CO.

Formerly ROLLED THREAD DIE CO. and REED SMALL TOOL WORKS

237 Chandler Street, Worcester 2, Mass., U. S. A.

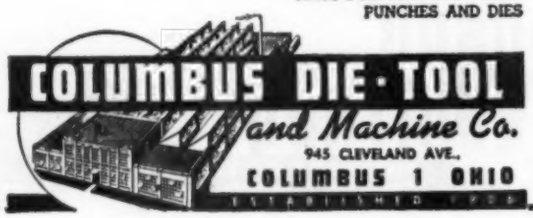
Mfrs. of Knurls – Thread Rolling Dies – Thread Rolling Machines

?

ARE YOUR TOOLING PROBLEMS YOUR BIG QUESTION MARK

No tooling problem is too complicated, too intricate for us. We've been solving them efficiently for over 40 years. Our engineers are tool designing specialists. Your tooling problem is a challenge to their ingenuity and technical skill. Columbus Die Tool have the right answers for your biggest questions.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



COLUMBUS DIE·TOOL and Machine Co.
945 CLEVELAND AVE.,
COLUMBUS 1 OHIO
ESTABLISHED 1905

MECHANICAL MUSCLES

FOR EVERY LIFTING AND CARRYING JOB

Install PORTELVATOR. The Hamilton portable elevating table. One man can safely lift and carry loads previously requiring the strength of four.

Raises, lowers, transports. Three table surfaces. Accessible from four sides. Four point support. Standard model capacities, 1,000 to 5,000 pounds. Special models built on order.

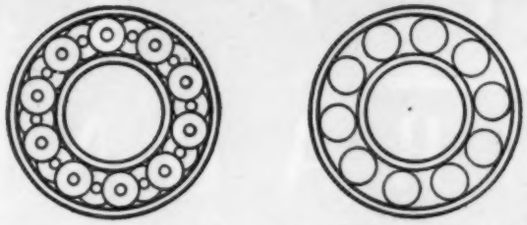
Write for Bulletin P-47

THE Hamilton TOOL COMPANY

830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

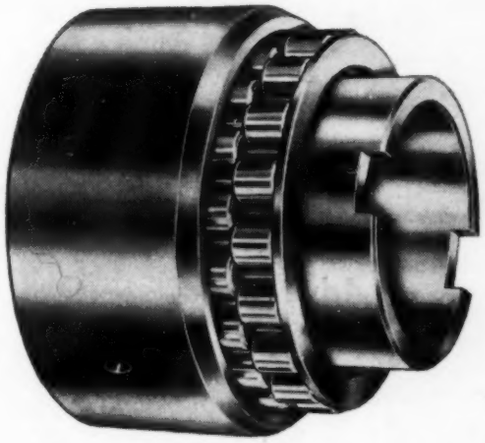
ORANGE "STAGGERED" ROLLER BEARINGS

...do the work of larger-size conventional bearings!



COMPARISON OF LOAD DISTRIBUTION

End views of Orange Staggered Roller Bearing and conventional bearings show how staggered roller design brings maximum roller surfaces in contact with load. Alignment with raceway load area is maintained and skewing is minimized, resulting in unusually even, smooth running.



THREE IMPORTANT ADVANTAGES

1. DESIGNING NEW EQUIPMENT. Carry the required load with smaller-size Orange Staggered Roller Bearings to save space, weight, and cost.

2. IN PRESENT EQUIPMENT. Change over to Orange Staggered Roller Bearings in present size, and gain additional load capacity, ample overload margin and longer service life.

3. FULLY INTERCHANGEABLE. Orange Staggered Roller Bearings are interchangeable with other solid race type bearings. Available in a full range of standard sizes in series 5100, 5200 and 5300; also with notched-type inner race, supplied with separable outer and inner races, as required. Special sizes to order.

ORANGE

SEND FOR ENGINEERING DATA BOOK showing dimensions, capacities, tolerances, application data. Use convenient coupon—or write on firm letterhead.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.

Please send me your Staggered Roller Bearing Data Book

Name..... Title.....

Company.....

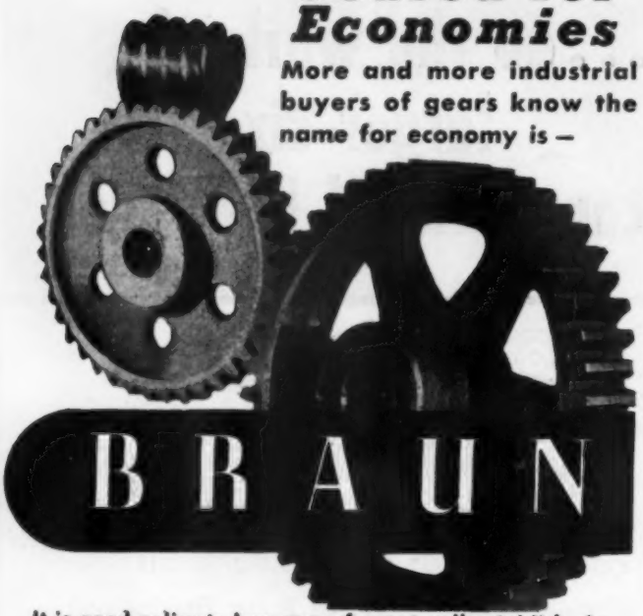
Address.....

City..... State.....

ORANGE ROLLER BEARING CO., INC.
554 Main Street, Orange, N. J.

Geared for Economies

More and more industrial buyers of gears know the name for economy is —



BRAUN

It is good policy to buy gears from a well-established organization with a modern completely equipped factory. Braun has the facilities and experience of 38 years in manufacturing large orders of gears. Send your prints to Braun for estimates without obligation.

BRAUN GEAR COMPANY

239 RICHMOND STREET BROOKLYN 8, N. Y.

SHELDON

T-S56 PRECISION LATHES

Why wear out big equipment on little jobs . . .

It costs money to operate big lathes—ties up costly equipment, takes more expensive tooling, more power, more floor space, requires a more experienced operator. It's just good business to have smaller, handier, faster, lathes like the SHELDON T-S56 for much of your work, and save the difference in operating cost.

The SHELDON T-S56 Precision Lathe has 11¼" Swing, 1" Collet Capacity (Large 1⅜" hole thru spindle) and is made permanently accurate with Zero Precision taper roller bearings.

Write for Bulletin

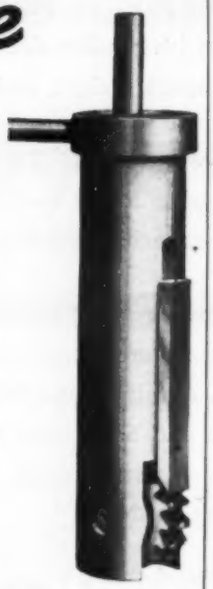
SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*



• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.

CINCINNATI, OHIO

Only Reliable Products Can Be Continuously Advertised

Famous for

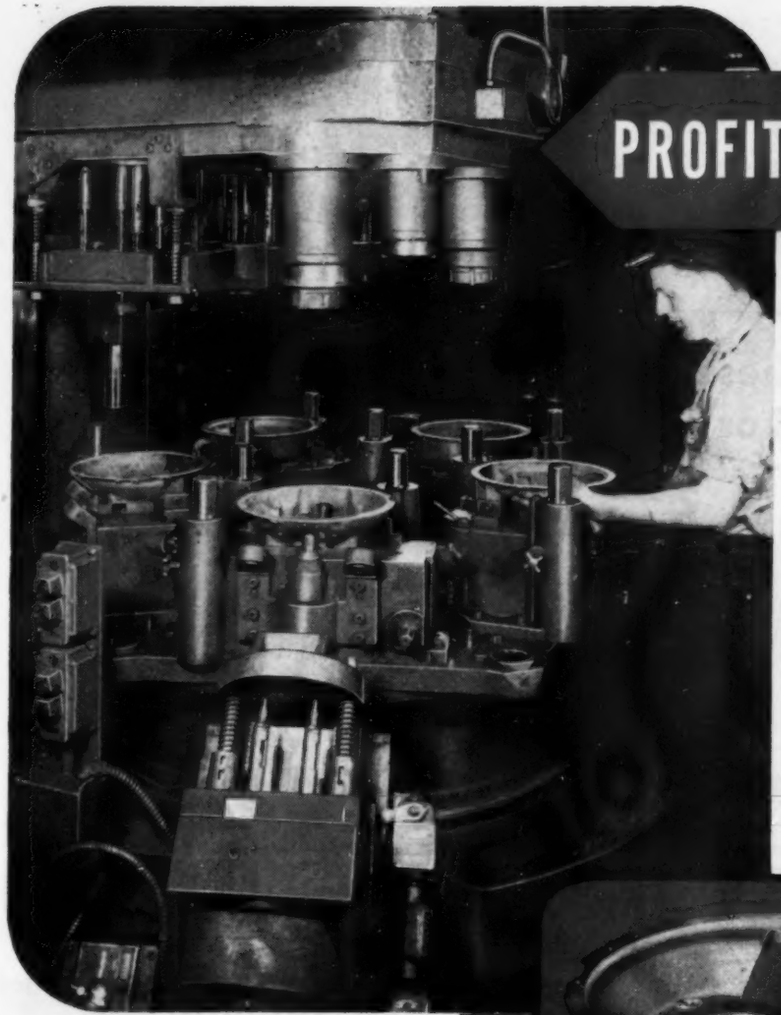
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Adv't. on Page 271, Jan. 29, '48 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.

Los Angeles: *A. C. Behringer, 524 N. San Pedro St., San Francisco: Guy Reynolds, 484 Vernon St., Oakland,* Canada: *F. Barber Machinery Co., Toronto, Canada.*



PROFITABLE PERFORMANCE

WITH THIS BAUSH 3-WAY MULTI-SPINDLE MACHINE

Yes, profitable performance from every Baush machine has been our ideal in more than 50 years of designing and building special purpose multi-spindle and multi-operation machine tools.

If your equipment is outmoded, or does not meet today's demands for quality machining at high speed and low production cost — a Baush engineer will be glad to go over your machining problems.

Write, wire or phone us today.

Part being machined: Clutch Housing

OPERATIONS:

Drill and ream flange holes —
Rough and finish bore the main bore —
Rough and finish bore starter hole —
Drill and spot face 6 holes in rear —
Drill and tap 2 angular pad holes.

PRODUCTION RATE:

Approximately 60 clutch housings — or 1320 operations per hour — at 75% efficiency.

Unit Illustrated is a Baush Special 3-Way Hydraulic Multi-Spindle Drilling and Tapping Machine:

Consists of welded steel base with ample chip trough —

1 — Vertical (36) spindle fixed center head mounted on hydraulic slide with dwell in feed —
Spindles: 4 — Special heavy-duty boring,
20 — No. 1 M.T. with nose adjustment,
6 — No. 2 M.T. with nose adjustment,
6 — No. 3 M.T. with nose adjustment.

1 — Auxiliary angular drilling unit on hydraulic slide —

1 — Auxiliary angular tapping unit on hydraulic slide — Both drilling and tapping units have a fixed center head and are furnished with 2 spindles with nose adjustment.

MOTORS:

1—50 H.P., 1800 R.P.M. for vertical head spindle drive
1 — 5 H.P., 1200 R.P.M. for hydraulic feed of vertical head
1 — 1 H.P., 1200 R.P.M. for auxiliary drill unit spindle drive
1 — ¾ H.P., 1800 R.P.M. for auxiliary tapping unit spindle drive
1 — 3 H.P., 1200 R.P.M. for hydraulic feed of auxiliary units and hydraulic rotating table.
1 — 50" diameter rotating table; six stations hydraulically operated with 5 holding fixtures mounted on a sub plate.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

We'll stake our reputation on STANDARD Adjustable MULTIPLE SPINDLE DRILL HEADS

Low Prices • Top Quality • These Heads can be adapted on either round or flanged quill machines.

5 TYPES 56 SIZES

WRITE TODAY for 1948 catalog.

US HEADS SINCE 1915

Also manufacturers of all types of fixed center heads

UNITED STATES DRILL HEAD CO.

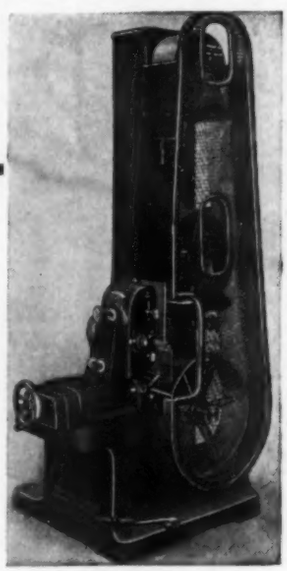
CINCINNATI 4, OHIO

"PRODUCTION" Type A HIGH SPEED POLISHING MACHINE

Providing Automatic Feed and Assuring Superior Finish . . .

This machine . . . for polishing and finishing metals, fibre, , wood, rubber, etc. . . . is a high speed, centerless feed unit. A power feed attachment makes it possible to feed cylindrical work in long or short lengths through the machine automatically. With Taper Feed Attachment, tapered cylindrical work can be handled continuously.

An outstanding feature of the Type "A" machine is the use of a two-belt system which provides for chip disposal immediately and which results in a finer finish of work. The capacity of this machine with power feed attachment, is 1/4" to 6" diameter round stock.



Specifications

Speed Leather Cushion Belt—6300 Ft. per min.

Floor Space—40" x 50".

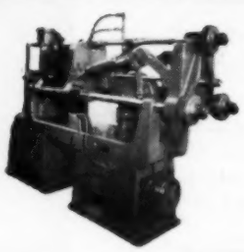
Height—89".

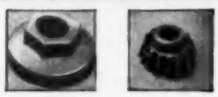
H.P.—10.

Write for illustrated literature describing this modern machine.

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

Fully automatic die casting machine produces 720 shots per hour





Here are examples of more output per manhour *every hour* from fully automatic die casting production. Nut above weighs 1 oz. Gear weighs 3/4 oz. Work Horse Model 16AZ, for zinc, tin and lead castings, produces each part in a single cavity die at 720 shots per hour. *Casting cycle is completely automatic.*

Die movement, shot and ejection occur in continuous, completely automatic cycles. Between-cycle delays are eliminated. There's no human element in determining hourly output. Operator merely fills melting pot occasionally and lubricates die. *At these high speeds, you can use single cavity dies and cut die cost 50 to 90%.*

Multiple cavity dies, however, are often used. Work Horse Model 16AZ has a 30 sq. in. casting area with 16 oz. capacity. There are four speeds: 240, 340, 520, 720 shots per hour. Conduit fittings weighing 0.6 oz. are produced at 240 shots per hour in an 8 cavity die. *That's 1920 fittings every hour from one low-cost machine!*

Increase output and dimensional accuracy . . . reduce floor space needs, die costs and downtime. Write for our folder on Work Horse Model 16AZ *today.*

LIGHT METAL MACHINERY, INC.

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NICHOLSON ROTARY FILES AND BURS

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A wide range of shapes and sizes from which to choose. Name almost any rough or delicate finishing operation that is "bogging down" your production and Nicholson will come up with a Rotary File or Bur that will save both time and money.

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Available in either Hand Cut (for use on tough, dense materials) or Ground-from-Solid (for non-ferrous metals). Three degrees of coarseness: coarse (C), medium (M), and fine (F). Expert hand-cutters form the teeth of Nicholson Rotary Files; precision machines grind the flutes of Nicholson Burs.

STEEL

Nicholson regular Rotary Files and Burs are made from a special grade of high-speed steel, expertly hardened and carefully shaped.

SHANKS

Standard shanks are ¼" in diameter. Nicholson also has a complete line of Rotary Files and Burs with ⅛" shanks. These "little fellows" are ideal for relatively delicate power filing. They, too, are made from high-speed steel—with one degree of coarseness only.

CODE SYMBOLS

The Nicholson system of identification makes for easy ordering. The first symbol identifies the style or shape of the head; second, the diameter of the head; third, the length of the head; and fourth, the coarseness of the cut.

TRADE-MARK

The famous Nicholson trade-mark is your assurance of finest quality obtainable. Keep in mind that Nicholson Rotary Files are carefully shaped, true-centered, accurately cut or ground, expertly hardened. Available through your industrial distributor.

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NICHOLSON ROTARY FILES

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Be not only ACCURATE: Grind an accurate chamfer angle, with accurate and *uniform* relief, but also, be

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SPEEDY: GRIND ALL THE LANDS IN VERY RAPID ROTATION—removing a small amount of material at each revolution, without burning and spoiling the temper—because of perfect utilization of air cooling.

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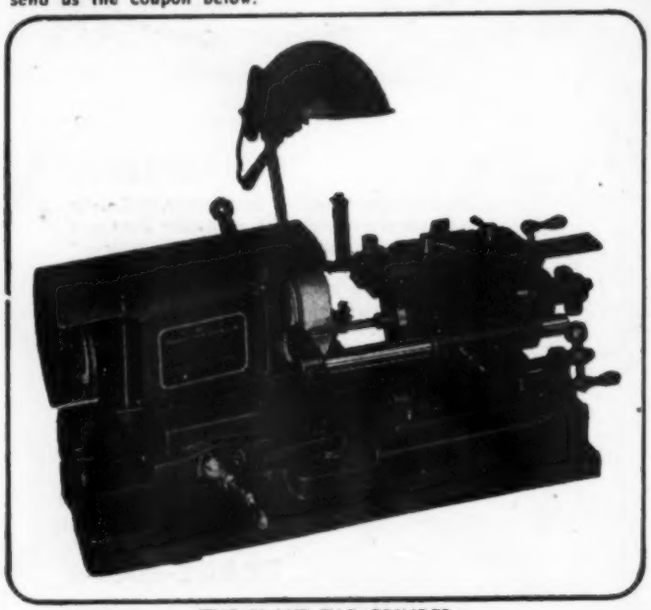
IF YOU, TOO, THINK A MODERN TAP GRINDER SHOULD DO AND BE *ALL* THESE THINGS . . . we suggest that you find out more about THE BLAKE TAP GRINDER . . . The only Tap Grinder on the market that can give you all of these tap sharpener requisites. Simply send us the coupon below.



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See this machine and the rest of the Blake line, Booth No. 701 at the A.S.T.E. Show.

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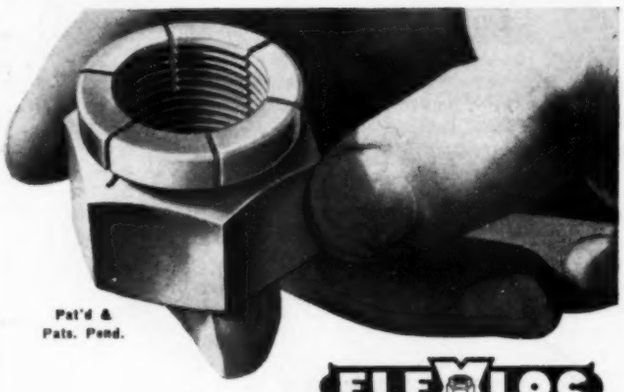

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The one-piece, all-metal "Flexloc" packs maximum usefulness in minimum space by combining, as it does, a stop, a lock and a plain nut all in one.

Every thread—including the locking threads—takes its share of the load. "Flexloc" accommodates itself to a wide range of thread tolerances . . . can be used over and over again without losing much of its locking torque . . . is not affected by temperatures likely to be met within the field of Mechanical Engineering . . . and being a "stop" nut, it stays locked in any position on the threaded member. The "Flexloc" is processed to have an exceptionally uniform torque.

The *Thin* "Flexloc" has become very popular because its *tensile* is so high and the space it occupies so small.

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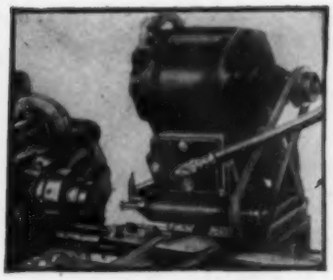
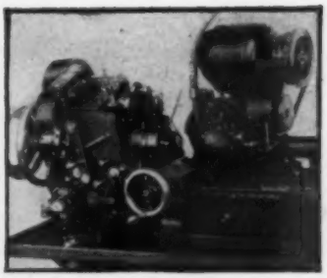
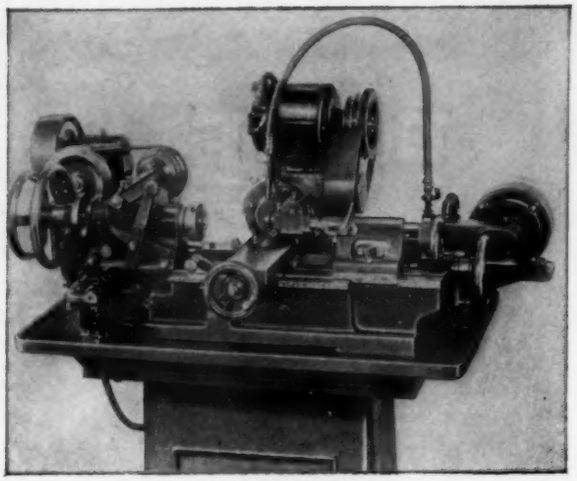


Machine equipped with Internal Milling Attachment



Machine equipped with Relieving Head



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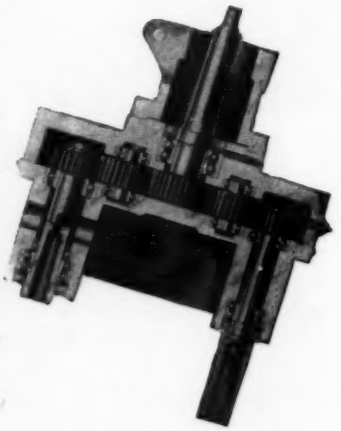

For complete engineering information, write to: Engineering Department, Thriftmaster Products Corporation, 1048 N. Plum St., Lancaster, Pa.

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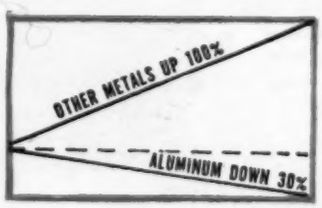

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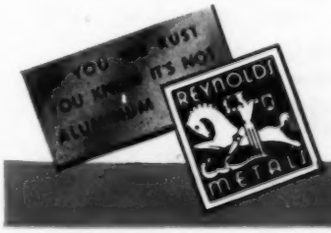

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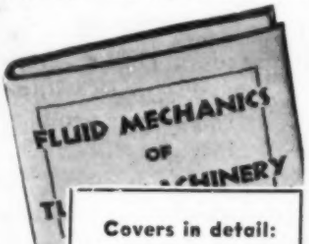

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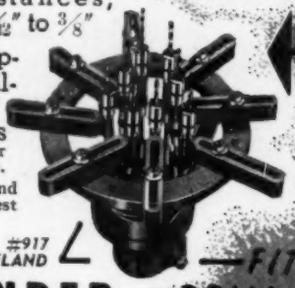

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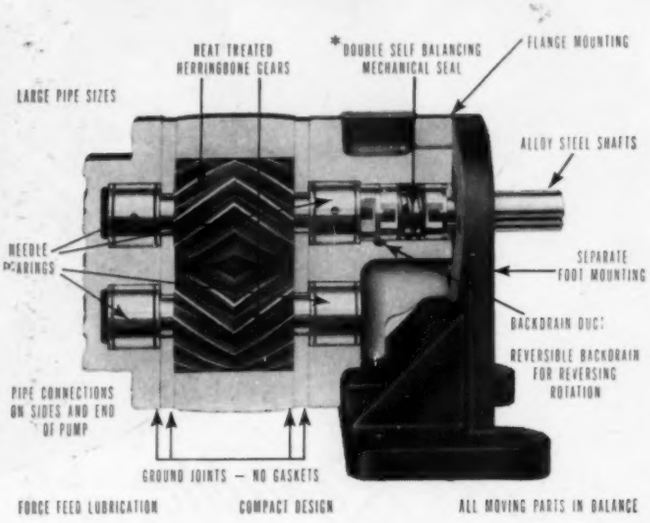

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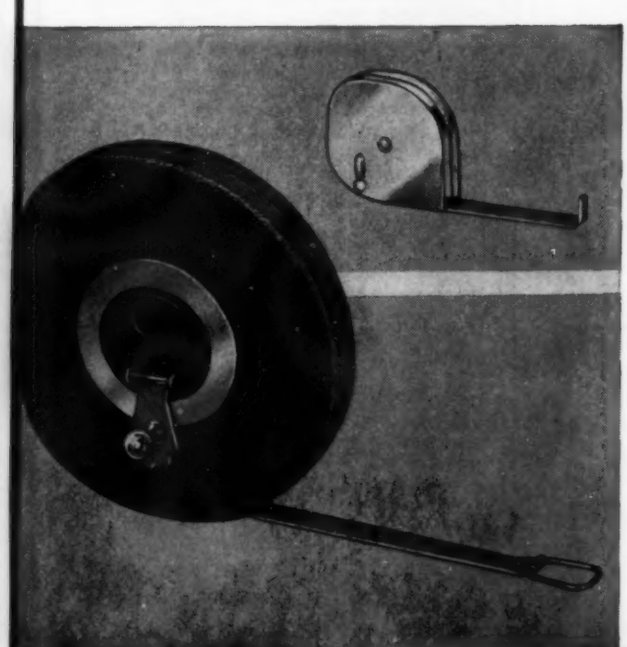

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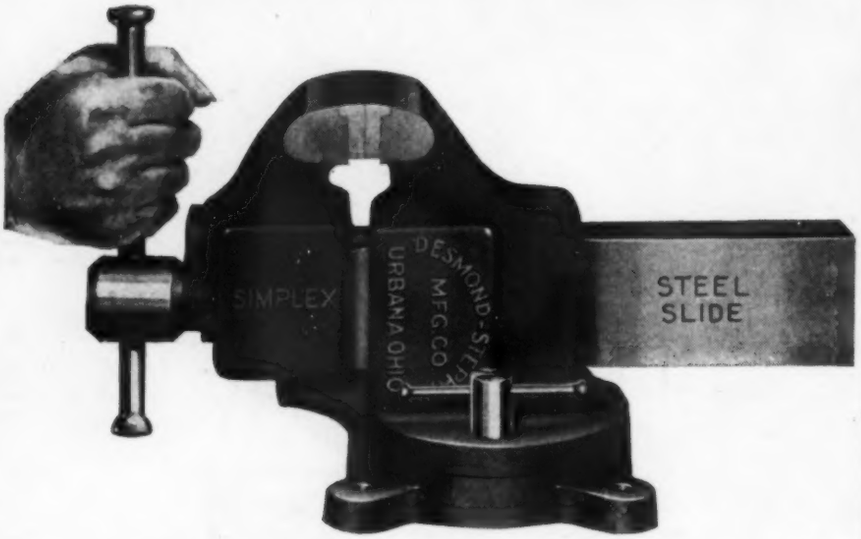

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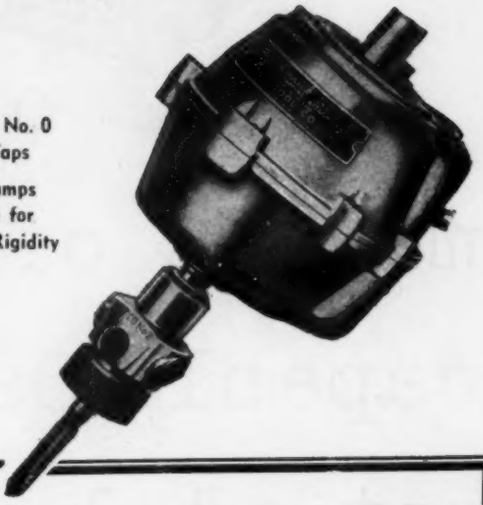

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TAPPING ATTACHMENT

Even inexperienced operators can turn out fast accurate tapping with Ettco-Emrick Tapping Attachments. All the needed tapping skill is provided by special design and construction features which assure maximum sensitivity and minimum tap breakage and work spoilage.

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Over 25 years specialization in solving Industry's drilling and tapping problems

Red Ring Rotary Gear Shaving Machines

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★ The Elliptoid tooth form may be shaved on these machines.

Model GCL FINE PITCH SHAVER for external gears 3/16" to 4" PD.

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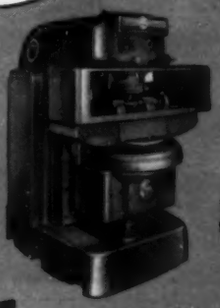
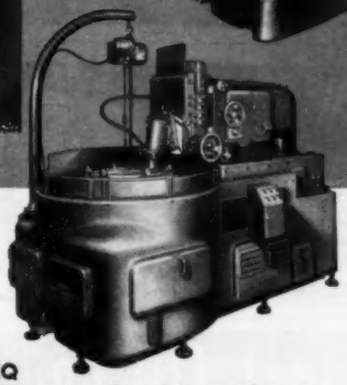


★ Model GCU DIAGONAL (2 Sizes) for external gears from 1" to 12" PD.



Model GCQ
(3 Sizes) for external and internal gears 5" to 48" PD.

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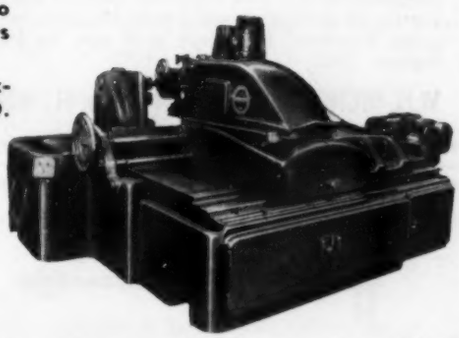

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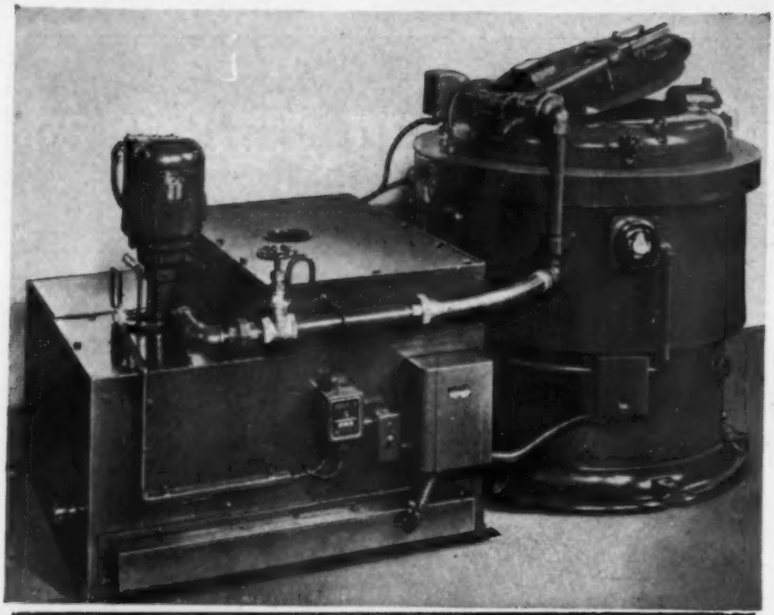

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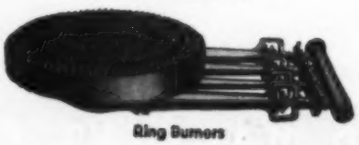

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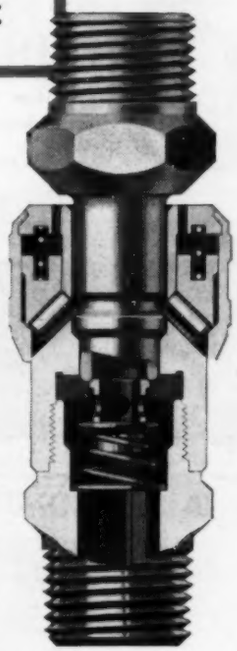

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ESTABLISHED 1885

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. cuts inspection rejects in bushing, sleeve, valve inserts, liners, seals, bearings, races, gears, pins, collars, shafts, etc. Bowser processing eliminates reaming because super finishes are retained when Bowser expansion fitting attains perfect mating without distortion.

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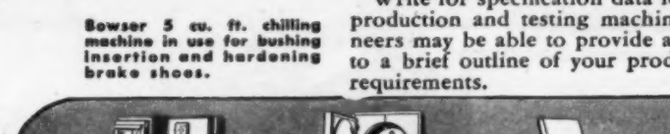

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A versatile tool for metal numbering, supplied with 1/64 to 3/8 inch Roman or Gothic figures, 4 to 7 wheels. Both consecutive and repeat settings are standard in all models.

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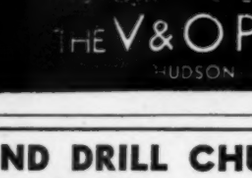

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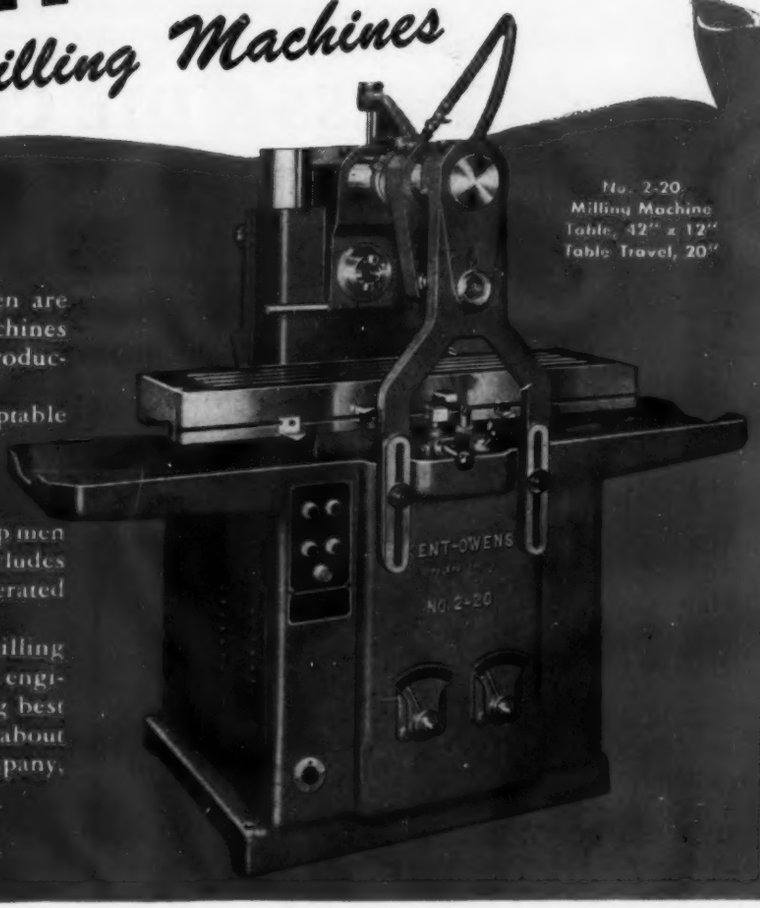
with KENT-OWENS *Milling Machines*



No. 2-20
Milling Machine
Table, 42" x 12"
Table Travel, 20"

Today more than ever—production men are depending on Kent-Owens Milling Machines for the *speed* and *accuracy* that keeps production UP and costs down!

These machines are versatile—adaptable to countless milling jobs. They're outstandingly rugged . . . efficient . . . dependable. Designed for easy handling with practical features that shop men like. The Kent-Owens Standard line includes a wide range of hydraulic and hand operated machines.

If you're "floored" by a tough milling problem—call on Kent-Owens! Let our engineers recommend machines and tooling best suited to your requirements. Write us about your needs. Kent-Owens Machine Company, Toledo, Ohio.

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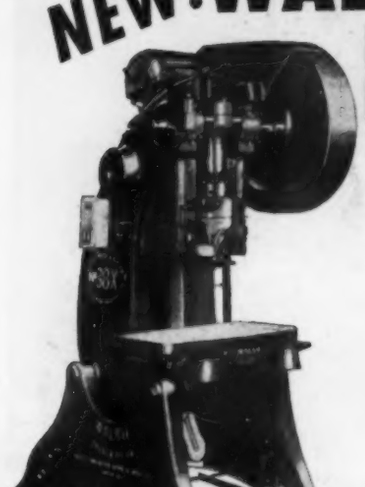

THE VERSATILE 38-TON PRESS FOR

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You get much in addition to economical production from this new, open back, inclinable punch press. Use No. 38X in your tool room for shearing-in dies and punches. Use it for die tryouts in place of a screw press. This high speed punch press gives exact indication of results on the production run . . . shows up defects in material at once, where the slower screw press would yield a perfect sample.

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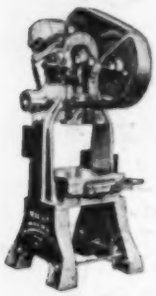
Also New!
WALSH 28A ARCH PRESS



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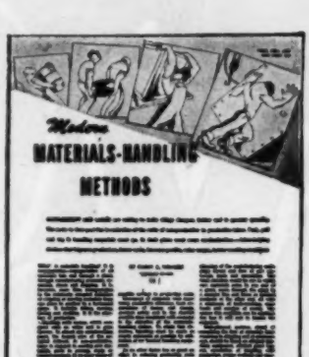

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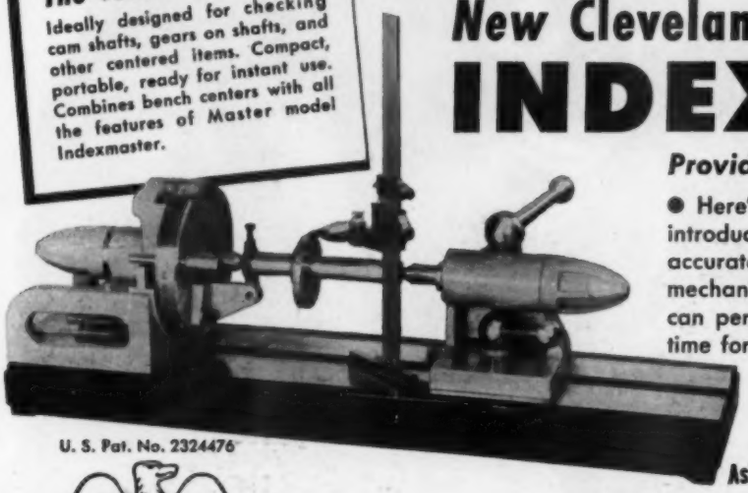
Ideally designed for checking cam shafts, gears on shafts, and other centered items. Compact, portable, ready for instant use. Combines bench centers with all the features of Master model Indexmaster.



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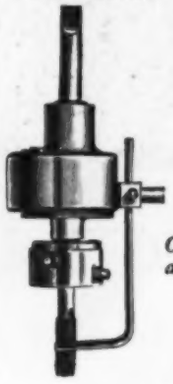
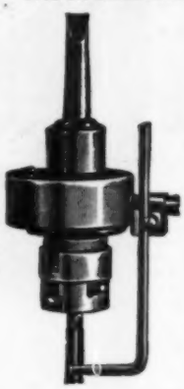


Size	Taps Exact Size
No. 00 H.S.	Up to 1/4"
" 00	1/8" 1/8"
" 0	3/16" 1/2"
" 1	1/8" 3/4"
" 2	3/8" 1 "
" 3	5/8" 1 1/4"
" 4	3/4" 1 1/2"
" 5	3/4" 2 "



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Style B Positive Stop Holds Work Down

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Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required.
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Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
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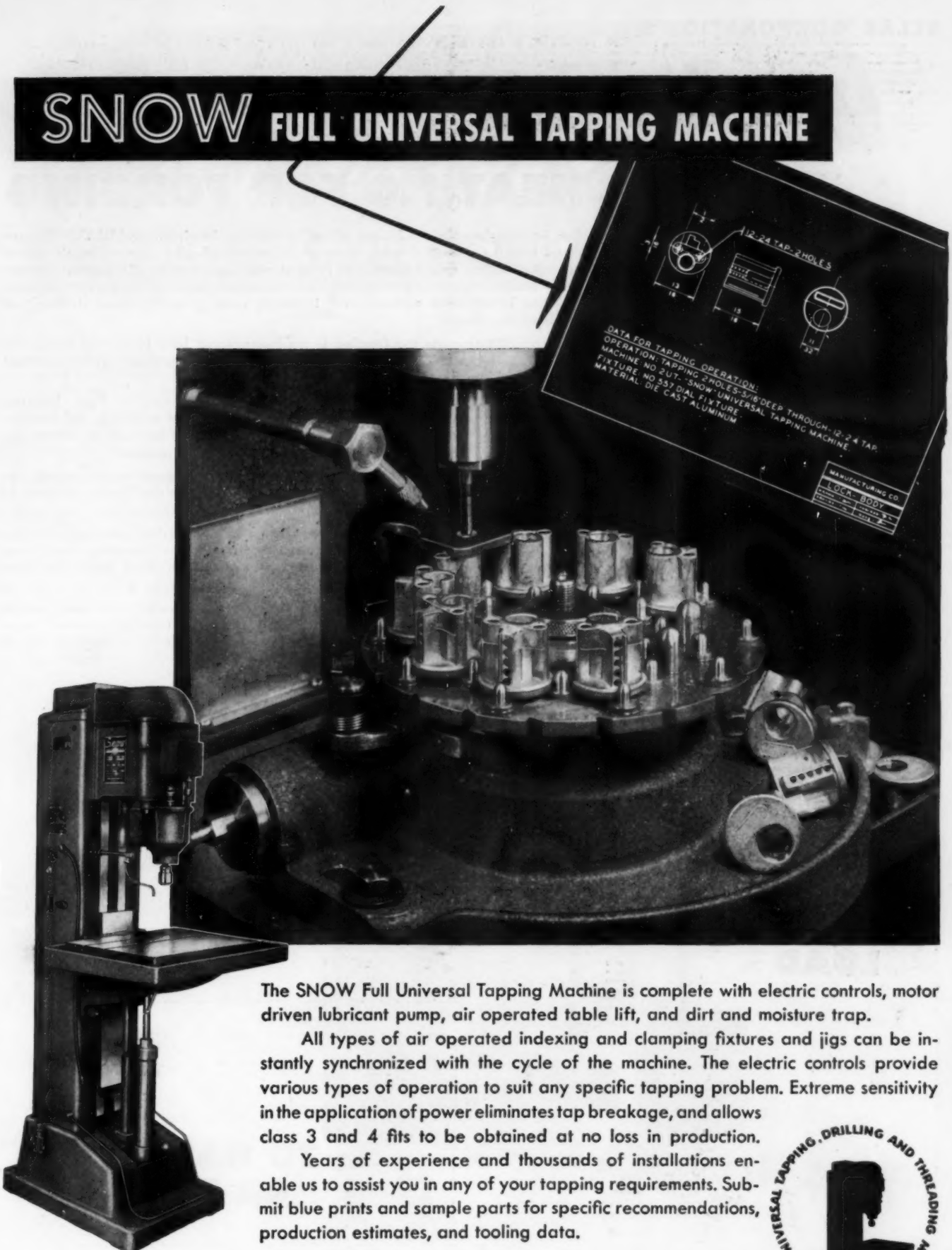
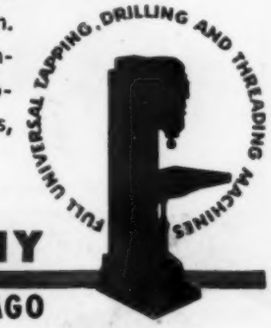
SNOW FULL UNIVERSAL TAPPING MACHINE



The SNOW Full Universal Tapping Machine is complete with electric controls, motor driven lubricant pump, air operated table lift, and dirt and moisture trap.

All types of air operated indexing and clamping fixtures and jigs can be instantly synchronized with the cycle of the machine. The electric controls provide various types of operation to suit any specific tapping problem. Extreme sensitivity in the application of power eliminates tap breakage, and allows class 3 and 4 fits to be obtained at no loss in production.

Years of experience and thousands of installations enable us to assist you in any of your tapping requirements. Submit blue prints and sample parts for specific recommendations, production estimates, and tooling data.



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SELAS CORPORATION'S

Gradiation

HEATING FOR FORGING

For heating portions of bars, axles, shafts for forging, GRADIATION patterns heat in a tunnel and, through it, mechanically conveys work pieces in rapid succession. Lengths of heated portions, sectional shapes, dimensions and temperature requirements can vary in a range in one design. Heating is uniform around and through with piece-by-piece delivery at production speed.

Heating of bar-ends for forging is an example of how large the collateral values of GRADIATION can be. The following comments reflect actual conditions for installations now operating:

FUEL COSTS: Savings in fuel consumption can be as high as 50% in comparison with conventional practices.

METAL SAVINGS: Fast heating with control of scale has reduced initial weight of bars prior to heating from 13 to 12 pounds.

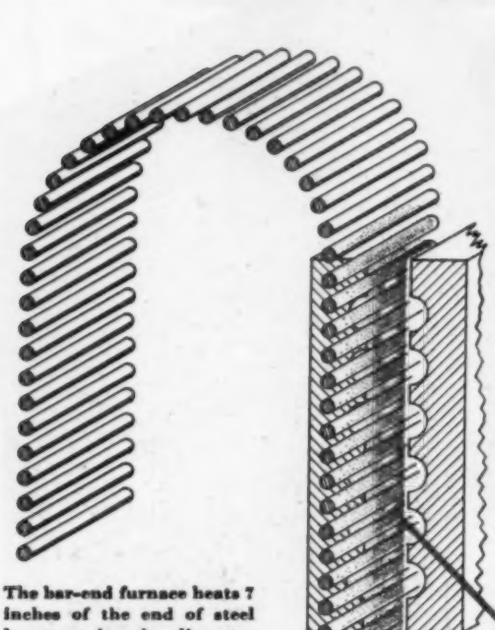
PRODUCTION: One production increase from 1800 forgings in 8 hours to 2400.

DIE LIFE: Plants report greatly increased die life and ability to work to much closer tolerances.

In the case of the bar-end furnace shown below worker comfort was improved. So little heat is radiated from this furnace that working conditions near it are as good as in other space in the assembly plant where furnaces are not used.

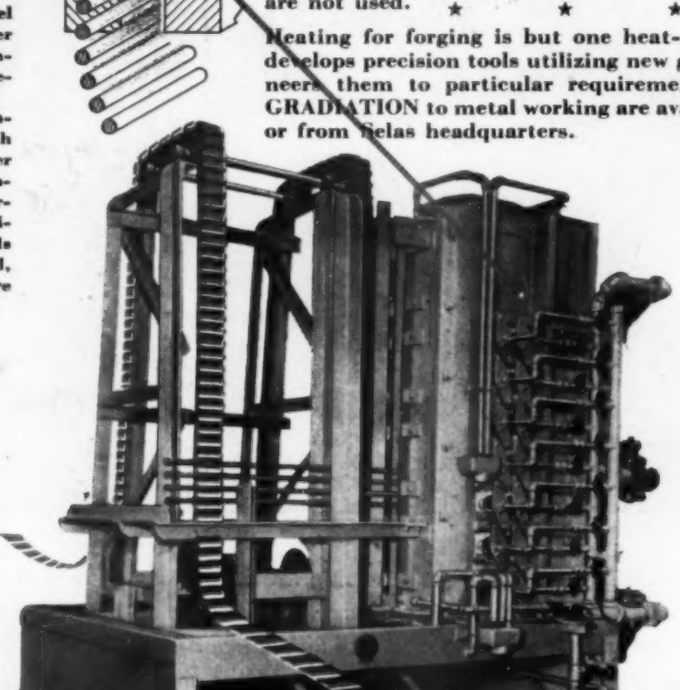
★ ★ ★ ★ ★

Heating for forging is but one heat-process for which Selas engineering develops precision tools utilizing new gas combustion techniques and engineers them to particular requirements. Data on other applications of GRADIATION to metal working are available through Selas Representatives or from Selas headquarters.



The bar-end furnace heats 7 inches of the end of steel bars ranging in diameter from ½ to 1½ inches. Temperature rise is from 70 degrees to 2250 degrees F.

Bars are loaded on a conveyor, at the back, which carries them upward, over and down to the gravity discharge, lower front. The furnace, provided with a vertical slot into which bar-ends are automatically inserted, has a gradient temperature of 2500 degrees F.



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Cuts time up to 75%
ON JOBS PREVIOUSLY HAND SCRAPED

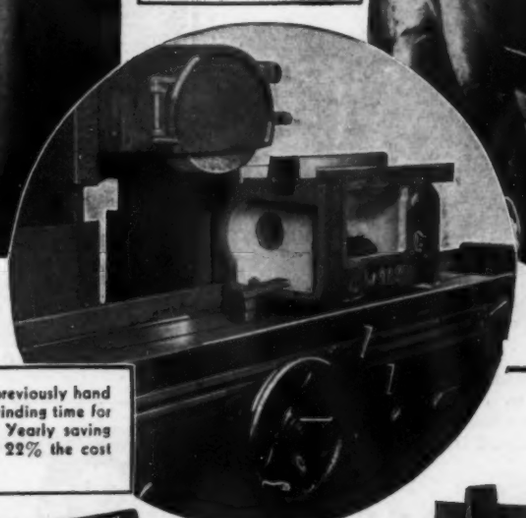
Examples: Time on pump case reduced from 40 hours to 4 hours . . . . . Time cut from 12 hours to 3½ hours on slide castings . . . . . Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this make a big difference in manufacturing cost. To see what Mattison High-Powered, Precision Surface Grinders can do on your work, send us blue prints for production estimates.

● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 80% savings in time. Finish planing and scraping operations eliminated.

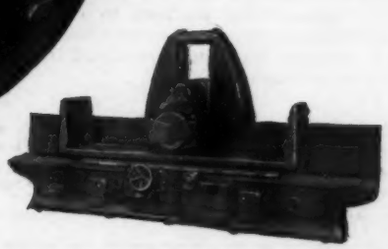
● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".

● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.

Write for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.



Mattison High Powered Precision Surface Grinder. Table Sizes: 12" to 36" wide, 36" to 192" long.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

CRATEX Soft Rubberized Abrasives

out-perform all others for light grinding, deburring, finishing and polishing

"CRATEX" is the registered trade name of a time-tested line of soft rubberized abrasives—Wheels, Points, Blocks, Sticks and other tools—if you want the BEST specify "CRATEX".

The cutting and polishing action of CRATEX wheels is soft and cushion like, yet strength and wearability are way above normal. Uniformity is maintained in their manufacture resulting in consistent performance. CRATEX wheels do not load or become clogged, requiring little or no dressing, and they can be operated safely at normal grinding wheel speeds (3000-5000-SFM).

Four standard grits—Coarse (C), Medium (M), Fine (F), Extra Fine (XF)

For catalog or specific information, write

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CUT DIE MAKING COST WITH CERRO-MATRIX

LEADING manufacturers in this country and Europe use the fast, accurate Cerromatrix Method of locating punches in relation to dies, without machining non-working surfaces to close dimensions. Dies and punches permanently secured for long runs. Attach coupon to your letterhead to receive 36 page Cerromatrix Manual.

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Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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Produced under License Issued by John Milton Luers Patents Inc.

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Now the school bus roars right past!

THE LITTLE RED SCHOOLHOUSE—home of a hundred pleasant memories of men who left it to build America—served well, had its day, and is going, going—or gone. Today, the community school bus, freighted with the hopes of a new time, roars right past to the big central school—advanced, scientific and better.

Going or gone with the little red schoolhouse, are countless industrial tools and methods you know. Once they were good, but now they're a drag on production. Efficient cutting tools today are tipped with carbide instead of steel.

When you install Nelco Carboloy-Tipped Cutters, and cut 100 slots in 1.4 hours instead of 3.2 hours—that's progress! That's cutting cost. That's boosting output. That's getting more pieces per man-hour. That's getting the jump on "little-red-schoolhouse" competition. That's just plain common sense.

Nelco Carboloy-Tipped Cutting Tools, with their tough, all-alloy steel bodies, can be mounted on standard equipment. They give you greater precision, finer finish, less tip breakage, more production, more profit. Let a Nelco Service Engineer show you how a moderate outlay for these modern tools will pay you many times over.

NELCO CARBOLOY-TIPPED TOOLS ARE **Sandwich Brazed**

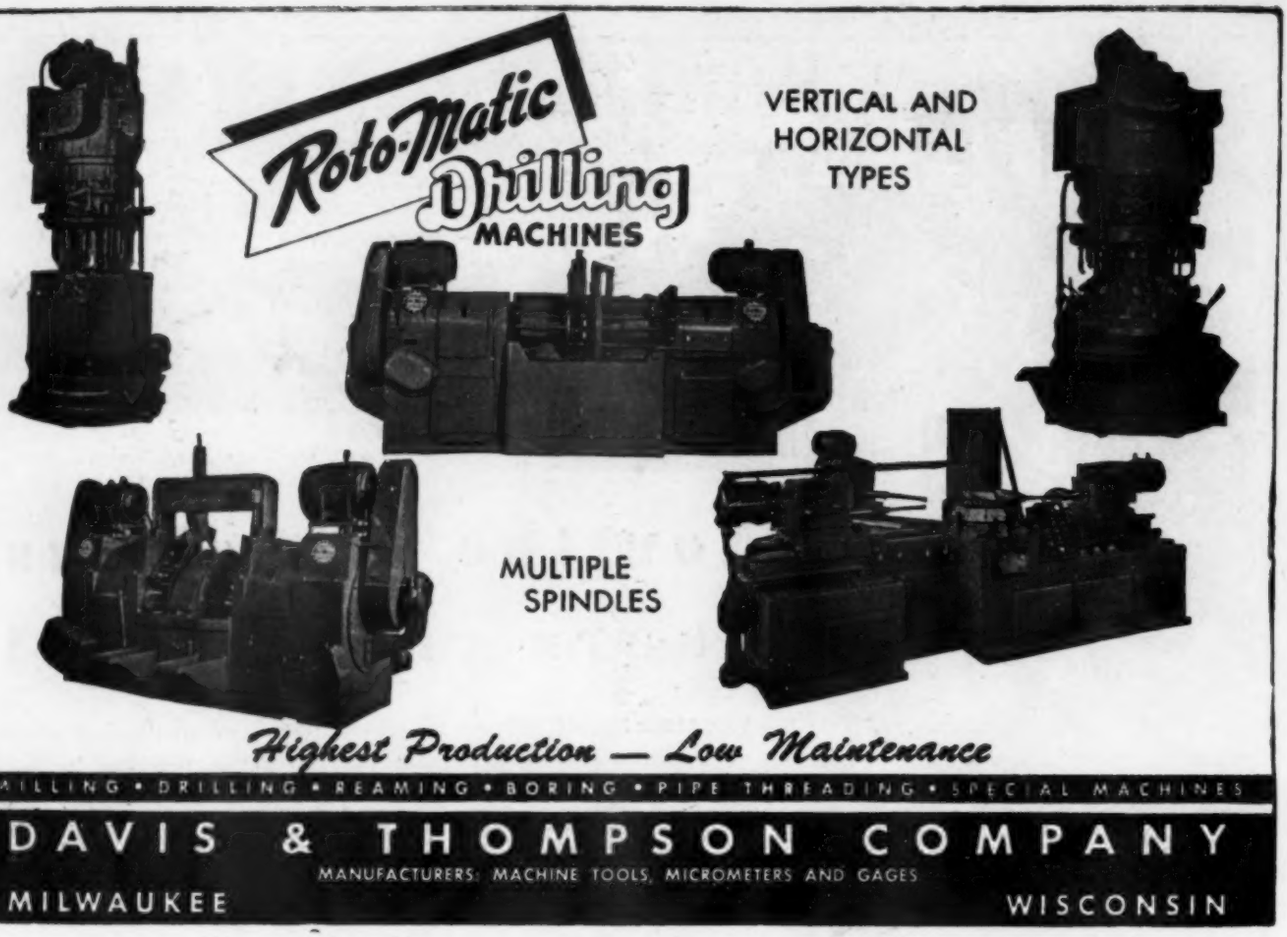
Every modern technological development is utilized in making Nelco the finest of all carbide-tipped tools. Sandwich brazing is one example of that. A strip of non-ferrous metal between cutting edge and tool permits expansion and contraction—increases the life of every Nelco tool.

CARBOLOY-TIPPED CUTTING TOOLS

NELCO TOOL CO., INC.

FOR THAT EXTRA EDGE IN PRODUCTION

266 CENTER STREET, MANCHESTER, CONN.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VERTICAL AND HORIZONTAL TYPES
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Highest Production — Low Maintenance
MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES
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Highly concentrated. Withstands pressures greater than 50,000 lbs. per sq. in. Free of lead and graphite. Non-corrosive. Originated by CMD. ACCEPT NO SUBSTITUTES.

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Keep A Lathe Humming

1. Dead or live centers
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3. Steady Rest
4. Tool Post Screw
5. Lead Screw
6. Wipers
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CMD Lubricants are available as oil or grease. Packed in 4 oz. tubes, cans (gallon, 5 gallons) and 55 gallon drums.

Write for FREE SAMPLE Tubes of CMD Multi-Purpose, Anti-Scoring Lubricants now! Address Dept. 2AM.

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HARDNESS TESTER

The Scleroscope is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

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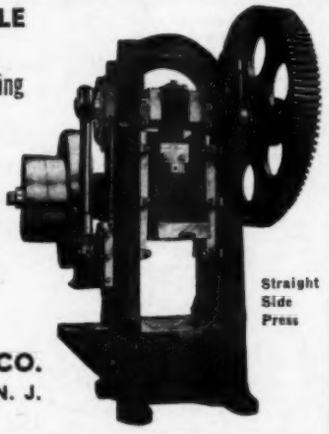
STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economicaly on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



Straight Side Press

ZEH & HAHNEMANN CO.
NEWARK N. J.
180 Vanderpool Street

The Gulf Lubrication Engineer "in the picture" (left) is checking the performance of Gulf Soluble Cutting Oil in this eyelet machine. (Right) Close-up shows method of applying the emulsion to the strip. (Photos courtesy of Plume & Atwood Manufacturing Co., Waterbury, Conn.)

"Gulf Soluble Cutting Oil

helps us get better finishes, fewer rejects"

says the management of this modern shop

" 'brassing up' eliminated . . . dies stay clean and cool"

"WE recently had a serious problem in connection with our eyelet machines," says the management of this up-to-date shop. "The brass cosmetic shells we produce had a tendency to stick in the dies. And the dies had to be changed too often due to 'brassing up.' In an attempt to correct this condition, we tried several drawing oils and compounds—without success."

"The day we tried Gulf Soluble Cutting Oil was the day our troubles stopped! With this quality oil our dies stay clean and cool—we've had no evidence of brassing up in producing 3,000,000 pieces on the same dies. As a result, we're getting cleaner draws, better finishes, and fewer rejects."

Hundreds of progressive machine shops and metalworking plants report results like these after switching to Gulf Soluble Cutting Oil. They find that this quality soluble oil is not only effective as a coolant and lubricant for drawing, forming and cutting metals, but is also excellent for use in hydraulic press systems.

Call in a Gulf Lubrication Engineer today and ask him to demonstrate these quality features of Gulf Soluble Cutting Oil: highly stable, helps prevent gummy deposits, helps prevent rust, emulsifies readily, has a clean, pleasant odor, and is nonfoaming. Write, wire, or phone your nearest Gulf office.

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GULF INDUSTRIAL LUBRICATION

Barker Two-Jaw or Three-Jaw WRENCHLESS CHUCK

will pay for itself in 60 to 90 days on production schedules by giving MORE parts per hour at a LOWER cost per part. Most round parts can be set in the Barker Wrenchless Chuck without stopping the machine. It saves time, helps speed up production, is simple to operate, reduces operator fatigue and cuts spoilage where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine. The Barker Chuck shown above, replacing an ordinary 3-jaw chuck, jumped production from 18 to 24 pieces per hour. It can do it in *your* plant too. Let us show you how!

Write for bulletin 201 today.

2 JAW CHUCK

3 JAW CHUCK

Chuck Division

THOMAS HOIST CO.

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PRECISION FEATURES . . . ACCURATE SHEARING

Wysong and Miles No. 1296, 8 Foot - 12 Gauge

with *Wysong and Miles* POWER SQUARING SHEARS

Cut shearing overhead on metals up to 10 gauge with *Wysong and Miles* Power Squaring Shears. Balanced semi-steel construction insures accurate alignment. Precision features cut down shearing time and give accurate work.

COMPENSATING HOLDDOWN
Individual spring activated plunger in each foot firmly clamps full sheets or small strips that come only under one plunger.

PRECISION BACK GAUGE
Ball-bearing, parallel back gauge is quickly adjusted to .0078 (1/128th) of an inch by a handwheel dial reading.

MULTIPLE DISK CLUTCH
Treadle activated friction clutch gives quick pick-up with a minimum jar. Clutch has a non-repeat safety feature.

Other fine Wysong and Miles Squaring Shears in 10, 12 and 14 gauge.
Write for complete information.

WYSONG and MILES Co

623 Fulton Street Greensboro, N. C.

the FINEST in SQUARING SHEARS and BENDING ROLLS

SCHERR *aids to precision – production*

Control the Job From Start to Finish with the WILDER PROJECTOR

New horizontal type for production inspection just out.

Throws a magnified shadow image of the part under inspection against an enlarged drawing of part. Magnifications available, 10x to 200x. Horizontal work table for flat work. Center support and micrometer cross slides for checking forming tools, screw threads, hobs, etc. Eliminates all errors due to "feel." May be speedily operated, with little or no experience. Prevents costly errors and insures initial correctness from the start of a production run. THIS COMPARATOR can be equipped with a new circular type of Surface Illuminator. Base price, $350.

The SCHERR MAGNI-RAY

An invaluable inspection tool, because it magnifies the work under inspection, floodlights it as well, and gives the immense advantage of "two-eye seeing." No wonder thousands of Magni-Rays are serving in large inspection departments, and other thousands on precision machines or critical toolroom operations. The lens is ground by experts for true magnification. Heavy base permits swinging lens to any position any height to 14 in. Three types—Model A, 3" lens, 1½x plus, $21.65. Model B, 3x plus, $29. Model C, 5" lens, 1½x plus, $34.

GAERTNER TOOLMAKERS' MICROSCOPE

For rapid precision checking of critical dimensions, angles, contours, etc. A scientific instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department and absolutely required for thread inspection. You can see that last ten-thousandth with the Gaertner. You can instantly spot the slightest deviation from correct angle. All eyes see it alike, too—no arguments. Any toolmaker can use it. Wide range of templets for use with the templet ocular head.

Save Time on Surface Grinders with SCHERR MAGNE-BLOX

When placed on magnetic chuck, these magnetism-conducting parallels and angle irons will firmly hold small pieces and irregular shaped work. *No need of special clamps or fixtures. THEY RETURN THEIR COST many times over by quicker setups, more accurate results, less danger of distortion and bowing when grinding thin flat work. Made in many different sizes and shapes. Ask for catalog. DON'T REGRIND YOUR MAGNETIC CHUCKS—BE WISE—USE MAGNE-BLOX—Special Offer.* Set consisting of 2 parallels 1 x 1¾ x 3¾ plus 2 V-blocks, hard brass and Swedish iron laminations in solid metal case $17.50. Money back if you can duplicate this value.

Write for full details on these tools, and for the Scherr Small Tool Catalog.

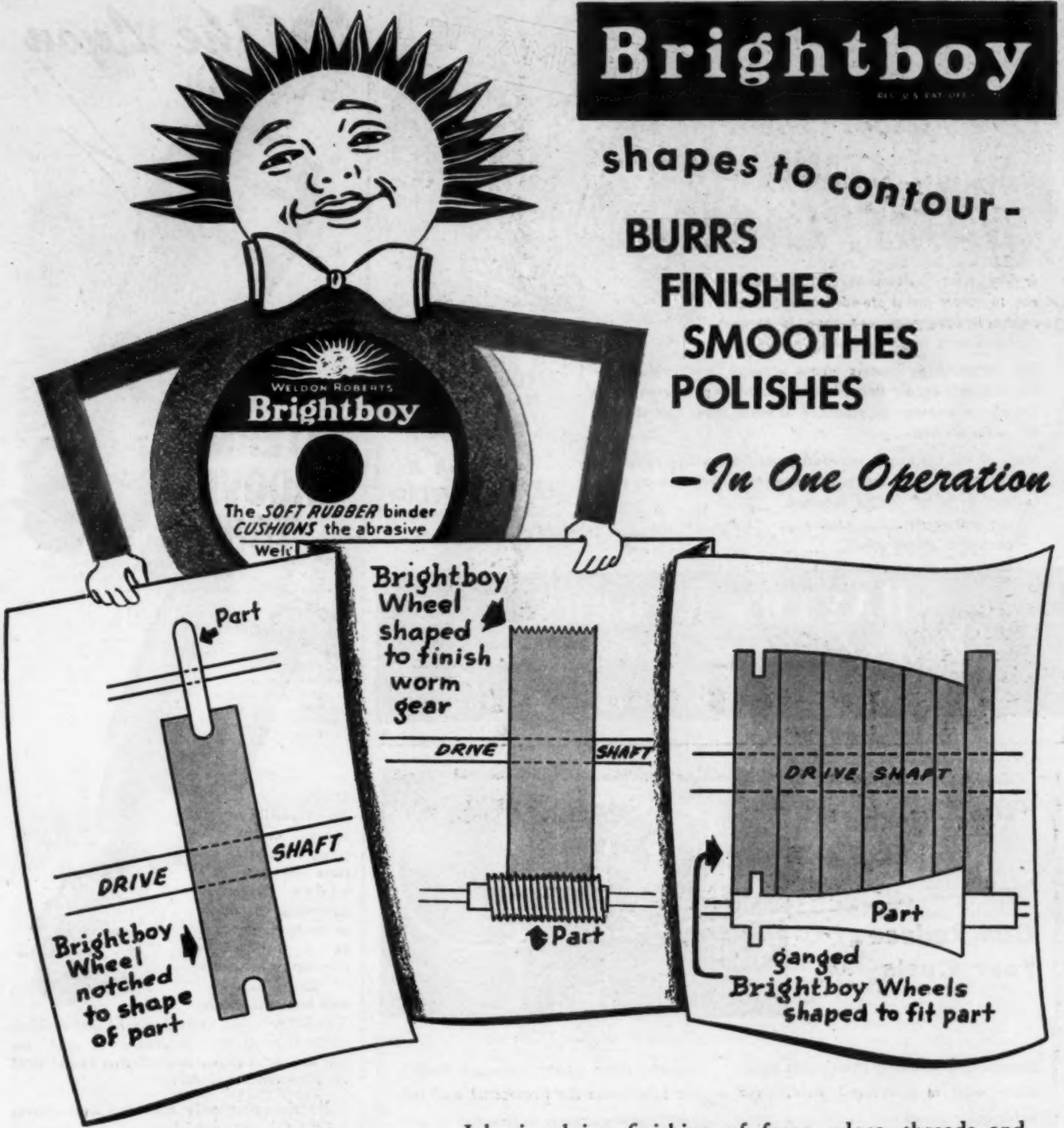
GEO. SCHERR CO., Inc.

Brightboy

shapes to contour -

BURRS
FINISHES
SMOOTHES
POLISHES

—*In One Operation*



Jobs involving finishing of faces, edges, threads and other shapes frequently are finished in one operation through Brightboy's outstanding work-versatility.

Quick, simple arrangement or shaping of the wheels, "ganged", beveled, or cut to fit the part, achieve single operation contour-finishing because of the combined action of Brightboy's rubber and abrasive.

Write for a Brightboy service engineer to call and suggest production short-cuts on your job; ask your dealer for the Brightboy catalog-manual and prices.

BRIGHTBOY INDUSTRIAL DIVISION

Weldon Roberts Rubber Co.,

Newark 7, N. J.

WELDON ROBERTS
Brightboy

AUTOMATIC

Custom Made
METAL STAMPED
NAMEPLATES

F M *Quality*

★ The most economical and satisfactory way to obtain metal stamped nameplates in practically any size or shape is through Dayton Rogers Metal Stamping Service.

Our die stamping process means economy, uniformity, quality, and outstanding appearance. Quantities as low as 50 or 100 nameplates can be produced at much lower cost than by any other method.

Many of the big names in industry use Dayton Rogers service. Any arrangement of letters and type of letter, such as solid, outlined or script can be obtained.

***WE PRODUCE** nameplates from sheet steel, aluminum, stainless steel, brass, and chromium plated steels.*

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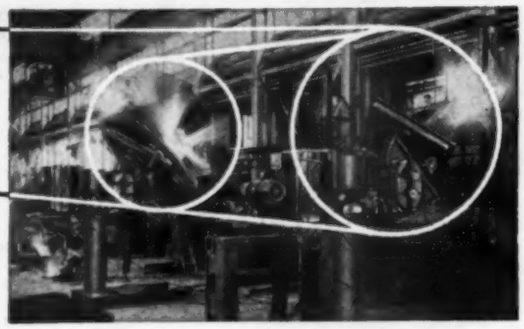
Positioned Welding

Can Reduce Your Costs



Because C-F Welding Positioners make every weld a downhand weld, your welding time and cost is cut to a minimum. Positioned welding permits use of larger electrodes—fillets of correct width and depth can be laid in one pass, with resulting time and material saving PLUS better welding. C-F Positioners with Variable Speed table rotation in any range from 0 rpm and up provide greater flexibility of positioner use in all types of automatic or hand welding. Like all C-F Positioners, these power operated models tilt 135° from the horizontal and full 360° table rotation is possible at any angle.

Investigate the definite cost-saving advantages of C-F Power or Hand Operated Positioners. All models have either variable or constant speed control of table rotation. *Write for Bulletin WP-22.* CULLEN-FRIESTEDT COMPANY, 1313 South Kilbourn Avenue, Chicago, Illinois

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

The Lyon

INTERNAL GROOVING TOOL

Its versatility saves costly preparation time — provides precision grooving of single or multiple grooves at a production rate—plus economy of set-up time — and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

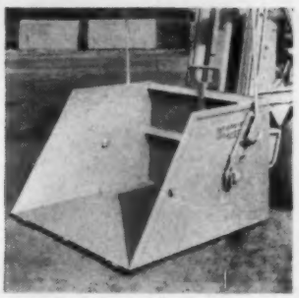
By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing any grooving problem without obligation.

LYON MACHINE CO., WORCESTER 3, MASS.

Mister- -Youve been Waiting for the "DID"

DEMPSTER DUMPSTER



Above skip type body. Below drop bottom body. Note how bottom forms chute for material.

Remarkably versatile and mobile, the new Dempster-Dumpster "DID" provides an efficient and economical intra-plant materials handling system applicable to nearly every industrial operation. With one hoisting unit handling many bodies, this system is ideal for shifting material from point to point in plant and yard operations. On each trip, up to 2500 pounds of material can be picked up and carried inside the plant from yard stockpiles. Ashes or waste can be carried outside, dumped into a bin or truck body not exceeding 94 inches in height.

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Shown above is the Dempster-Dumpster Type "DID" Tractor Hoisting Unit dumping a tilt-type body. At left top, the tilt-type body is in carrying position, and below Hoisting Unit approaches body to make the pick-up which is accomplished without the driver leaving his seat.

Detachable bodies are made in many designs to suit any need. Photos at right above show, for example, two other standard types. Write today for completely illustrated literature on this remarkable new Dempster development.

DEMPSTER BROTHERS, Inc.

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precision in production quantities

Our business is to produce precision gears in production quantities to customers' specifications, and to meet the delivery schedules previously agreed upon. Our proficiency in our chosen business is conceded to be high—chiefly because of a policy which was initiated by the management of Perkins nearly 30 years ago: We like to have our customers look upon our maufacturing facilities as part of their *own* plant, and work with them on that basis of close cooperation. Once your specifications are in our files, reorders are filled automatically. Let us quote on your requirements now.

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Springfield 2, Massachusetts

Our extensive facilities and modern machine tools are also adaptable to the manufacture of all kinds of various parts other than gears, such as the following:

SPROCKETS SPLINED SHAFTS SCREW MACHINE PARTS
up to 2¼" in. diameter

We are also exceptionally well equipped to build, to your specifications, such mechanical units as—

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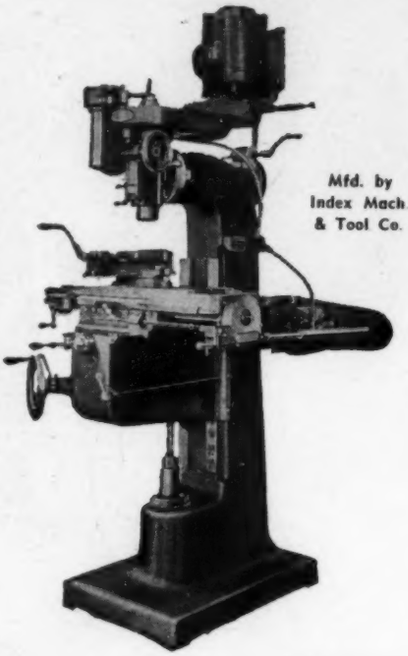
either in experimental or production quantities. Our well-known reputation is your guarantee of satisfaction. Let us quote on your requirements.

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

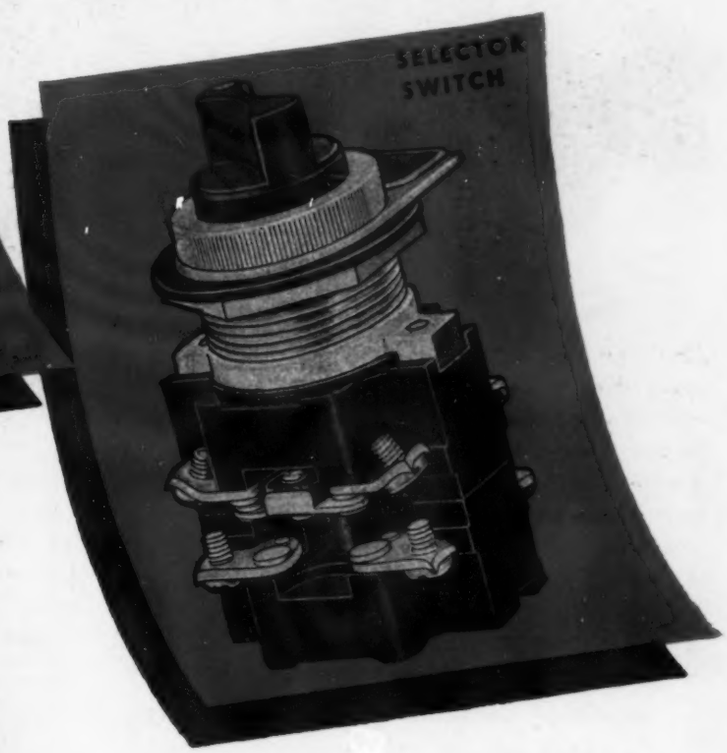
A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

INDEX MACHINE COMPANY
540 North Mechanic St.
Jackson, Michigan

NO OIL-FOULED CONTACTS with CLARK OIL-TIGHT PUSH BUTTON UNITS

Now you can avoid fouling contacts from seepage of oil or cutting compounds with these new "3C" developed Push Button Elements, Pilot Lights and Selector Switches that are *entirely oil tight*. A steel faced oil-tight washer is held snugly against both front and rear of the panel by close fitting nuts. An oil-tight boot closely grips the button, effectively sealing it against leakage.



These heavy-duty Type DO units have the same basic elements as the "3C" Type "D" units which have established such excellent records in heavy-duty use. Push Buttons and Selector Switches feature Silver-to-Silver Double Break Contacts. All units have large, easily accessible terminals that simplify wiring. Selector Switch permits 2 or 3 position operation. Vertical mounting is standard, but all units are adaptable to horizontal mounting. Mushroom head available for Push Button. Color caps for Pilot Lights are available in Red, Green, Amber, Blue, Clear and White.

Write for Bulletin 100—Oil-Tight Push Buttons.

THE CLARK CONTROLLER CO.

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• Representing a new development, WELDON Stub Arbors are specially designed to be used in place of the longer, unwieldy, conventional type of milling machine arbors. They can be handled with greater ease and convenience. At the same time the initial cost is less.

They are firmly held by the successful double screw drive and are especially adaptable to tool room and light manufacturing operations. Sold in sets or singly.

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with Sizes and Prices

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SYMBOL OF SERVICE for Steel Users

UNITED STATES STEEL SUPPLY COMPANY
USS
STEELS
SERVICE

ALL you have to do is telephone, wire or write our warehouse nearest to you.

We have on hand to fill your requirements: No. 2B finish sheets of proven excellence; No. 4 finish sheets of uniform quality; bars meeting high standards of machinability; plates in sizes up to 120" wide and 360" long; tubing, welded and seamless; pipe, angles, channels and welding electrodes in all standard grades and specifications.

Moreover, you have the help of our engineers in selecting the grades of U·S·S Stainless best suited to various types of service or that will fabricate best on your equipment. Free technical bulletins and booklets, showing the many and varied uses of U·S·S Stainless, also are supplied on request. And once a month we publish an up-to-date Inventory Bulletin which lists our stocks of Stainless.

Whether you need advice, or have a definite order, you're sure of getting what you want *quickly* by contacting our nearest warehouse.

If you use Stainless and are not receiving our monthly Inventory Bulletin, write for it right away.

United States Steel Supply Company

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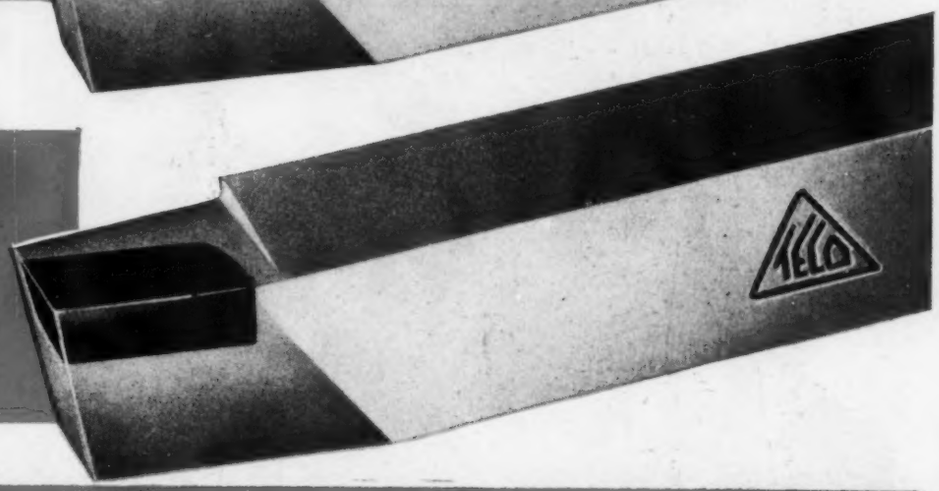
ST. LOUIS (3)	311 S. Sarah St., P. O. Box 27	LUcas 0440
TWIN CITY	2545 University Ave., St. Paul (4), Minn.	NEstor 7311

UNITED STATES STEEL

REPLACE THIS—

WITH THIS—



and get 3 to 10 times more pieces per tool!

YES, it's as easy as that! No extra effort, no additional equipment, no special procedure—just a change to Improved TECO Cemented Carbide and you make huge savings on your turning, facing and boring jobs.

Extremely resistant to wear and breakage, Improved TECO outlasts other carbides 3 to 10 times. It produces more pieces between grinds, gives more grinds per tool. It reduces down time and tool costs. It operates at higher speeds, heavier feeds, gives a better finish.

Order a set of Improved TECO Tools (or blanks) to tool up a machine and verify these facts in your own shop. Send details of your job set-up for proper recommendation.

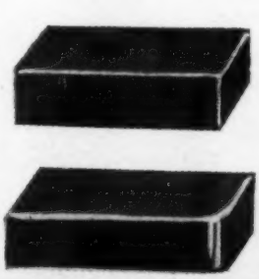
Another Typical Job!

Part: Truck Axle Shaft (GMC)
Material: S.A.E. 4140 Forging heat treated 320-340 Brinell
Machine: 12" Fay Automatic
Operation: Straddle Facing Flange
Diameter: O.D. 5.450"
Length of cut: 1" Front face of flange
2" Back face of flange
Depth of cut: 3/32" to 5/32"
Feed: .013"
Speed: 226 RPM
PIECES PER GRIND: 220 average
Best previous carbide production: 50 pieces

TECO Grade CF used
TECO R-145 Blank used

TUNGSTEN ELECTRIC CORP. 568 39th ST., UNION CITY, N. J.

Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representatives: Indianapolis, Ind., Detroit, Mich.



Manufacturers of
TECO CARBIDE BLANKS and TOOLS

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CEMENTED CARBIDE

Manufacturers of Tungsten Carbide—from ore to finished material—for over a quarter century.

FLAME HARDENING

Cross-section cut of *Flame Hardened* Gear Tooth. Note that all wearing surfaces are hardened.

makes gear teeth last longer and transmit more power

Results have proved that from 2 to 3 times the power can be transmitted by a "surface hardened" gear compared to an untreated gear of the same size. On small gears, case-hardening will produce satisfactory results, —but this is not practical for large gears, because of the relatively high distortions,—so *Flame Hardening* was developed. By the *Flame Hardening* of "Phillie" Gears, the core of each tooth remains *unchanged* in structure, because the heat penetration is controlled (see picture at left) i.e., all the *wearing surfaces are hardened*, and therefore, no measurable distortion can be found . . . . Tooth bearings have been checked repeatedly, before and after hardening, and show no change. Then too, *Flame Hardening* eliminates costly grinding and lapping operations.

Our *Gear Catalog* No. 46 describes *Flame Hardening* in particular, and gives details of our facilities for the manufacture of all types of industrial gears. Send for a copy of this valuable book,—and please use your business letterhead when writing.

Philadelphia

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Smoother...Quieter OPERATION
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An outstanding characteristic of Cincinnati ZEROL* bevel gears is the localized tooth contact. This permits a slight tolerance in positioning gears when assembling. For smoother . . . quieter operation with faster assemblies we suggest Cincinnati ZEROL*.

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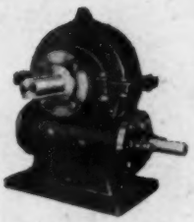
that spell real efficiency



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Manufacturers of Grand Rapids Grinders
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FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after April 1, 1948)

MACHINES AND ATTACHMENTS

1 CUTTER GRINDER — Ingersoll Milling Machine Co., Rockford, Ill. 48-page catalog 57 acts as an operator's instruction manual and as a repair and maintenance guide. Catalog describes applications of the grinder and lists recommended grinds for varied face mills of different materials.

2 DRILLING, BORING — National Automatic Tool Co., Dept. 50, Richmond, Ind. 68-page booklet entitled "A Cross Section of Work Performed on Drilling, Boring, Facing and Tapping Machines for the Metal Working Industry," covers 66 case histories. Booklet is spiral bound.

3 PLANER MILLERS — The Cincinnati Planer Co., Cincinnati 9, Ohio. 40-page bulletin 106 illustrates and describes Cincinnati Hypro planer-type milling machines, including capacities, dimensions and features.

4 DIE-CASTING MACHINES — The Hydraulic Press Mfg. Co., Mount Gilead, Ohio. 12-page bulletin 4805-A covers small-capacity die-casting machines for both zinc and aluminum alloys. Specifications are included for the submerged-plunger injection machine for lower melting-point alloys and the cold-chamber injection machine for aluminum and magnesium.

5 HYDRAULIC PRESSES—Hannifin Corp., 1101 S. Kilbourn Ave., Chicago 24, Ill. 22-page bulletin 130 covers with specifications and illustrations Hannifin's line of standardized hydraulic presses including straightening, forcing, and column-type presses.

6 DRILLING, TAPPING — Kaukauna Machine Corp., Kaukauna, Wis. 8-page pamphlet entitled "Portable Drilling and Tapping Machines," illustrates models having universal and tilting head construction.

7 DOUBLE-SPINDLE DISK GRINDERS—Hanchett Mfg. Co., Big Rapids, Mich. 12-page bulletin 647-1 illustrates and describes the double-spindle disk grinding method of finishing opposite faces of work pieces, flat and parallel simultaneously.

8 HYDRAULIC GRINDER — Landis Tool Co., Waynesboro, Pa. 4-page folder CB-47 covers with illustrations and drawings the 6-in. type CH plain hydraulic grinder. Features include microsphere wheel spindle bearing, dynamic balance, and hydraulic table traverse.

9 SLOTTERS—Rockford Machine Tool Co., Rockford, Ill. 20-page bulletin 460 covers the Rockford Hy-Draulic 36- and 48-in. slotters. Design, construction and application are presented. Dimensional diagrams illustrate work range.

10 METAL STITCHER—Seybold Div., Harris-Seybold-Potter Co., Dayton, Ohio. Two 4-page folders and single page illustrate and describe Morrison wire-stitching machines for assembling and sealing corrugated and solid-fiber containers, model 3J for bookstitching, and model 12Z for heavy-duty work.

11 TAP SHARPENING—Edward Blake Co., Newton Centre 59, Mass. 8-page bulletin 647 covers precision tap sharpening on the Blake flute grinder. A chart of settings for grinding flutes and spiral points on 2-flute and 3-flute taps is included.

12 HYDRAULIC PRESS — M & N Machine Tool Works, Clifton, N. J. 4-page folder covers the 30-ton hot-plate press which is self-contained. Press has a ram diameter of 5 in., and a daylight opening of 10 in.

13 GEAR LAPPING — Michigan Tool Co., Detroit 12, Mich. Folder describes Michigan's universal duplex lapper, Model No. 993, for lapping gears ranging from 2½ to 20 in. in diameter and clusters to 30 in. in length.

14 DRILLS — Canedy-Otto Mfg. Co., Chicago Heights, Ill. 16-page bulletin 90 covers 21-in. sliding-head floor drills, bench drills, radial drills, and other floor drills. Specifications are given covering the number of spindles required.

TOOLS AND ACCESSORIES

15 SAW-BLADE CHART—Victor Saw Works, Inc., Middletown, N. Y. 17x22-in., two-color wall chart shows proper hand, band or power saw blade to use for cutting any type metal. Chart graphically illustrates the right and wrong way to use a metal-cutting saw blade and tells how to overcome common metal-cutting troubles.

16 CUTTING FLUIDS—D. A. Stuart Oil Co., Ltd., Chicago 23, Ill. 72-page revised edition of the booklet entitled "Cutting Fluids for Better Machining," contains data on the application of Stuart oils for cutting, grinding, drawing, and other phases of metalworking and industrial lubrication.

17 CARBIDE SHEET-METAL DIES—Carboloy Co., Inc., Detroit 32, Mich. 36-page catalog D-124, called "Carboloy Die Engineering Manual," contains technical data and general information as well as specifications and illustrations.

18 GEARS—Westinghouse Electric Corp., Pittsburgh, Pa. 40-page spiral bound booklet B-3730 covers history of gears, modern gear drives, speed reducers, high-speed drives, gearing research and varied types of drives.

19 INJURY IN GROUND SURFACES —Norton Co., Worcester, Mass. 76-page booklet illustrates and describes the types of defects, such as cracks and burns. It presents, in detail, information on detection of injury and procedure in trouble shooting.

20 ROTARY FILES—Charles L. Jarvis Co., Middletown, Conn. 12-page bulletin 101 illustrates complete line of high-speed and tungsten-carbide rotary files. Bulletin pictures in detail more than 100 files.

21 GEAR CHECKER—National Broach and Machine Co., Detroit 13, Mich. 16-page bulletin C45-11 illustrates and describes the Red Ring universal gear checker, giving necessary specifications.

22 RECORDED LEAD CHART—Illinois Tool Works, Chicago 39, Ill. 8-page pamphlet illustrates and describes the Toolgraph chart, an electrically recorded lead chart for each job. Record shows exact location of each tool on a hob in relation to a desired theoretical lead helix.

23 MOBILE COOLANT FILTER — Honan Crane Corp., Lebanon, Ind. Single page inserts, pages 13 and 23, illustrate the company's mobile coolant filter and continuous conveyor, respectively. Capacities are included.

Example

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24 REAMERS—The Gammons-Hoeglund Co., Manchester, Conn. 20-page bulletin covers all types of Gammons' reamers including helical-taper pin reamer with varied shanks, helical duplex hand reamer, and others.

25 MARKING MACHINES—The Noble & Westbrook Mfg. Co., East Hartford 8, Conn. 28-page catalog 47 illustrates and describes marking devices for marking of metal products. Catalog covers marking, graduating, embossing, and numbering.

26 POWER-DRIVEN BRUSHES—The Fuller Brush Co., Hartford, Conn. 32-page booklet covers with illustrations Fullergript power-driven brushes. Booklet describes applications of brushes as an integral part of machine for automatic brushing operations.

27 CARBIDE-TIPPED TOOLS—Whitman & Barnes, Detroit 16, Mich. 24-page Catalog 101 lists and illustrates various types of carbide-tipped tools, such as straight- and taper-shank spiral fluted drills, core drills and masonry drills. Catalog also contains information on use and care of tools.

28 PRODUCTION-CONTROL SYSTEM — Chronolog Incorporated, Detroit 26, Mich. 4-page pamphlet gives information on the Model X Chronolog, designed for the reduction of idle-equipment time. Unit gives information on employee performance.

29 INDUSTRIAL SAPPHIRE TOOLS —Sapphire Products Div., Elgin National Watch Co., Aurora, Ill. 8-page bulletin entitled, "Why Sapphire," gives information covering the bonding of sapphire to metal, thus producing a hard material for industrial uses.

HEAT-TREATING AND WELDING

30 WELDING EQUIPMENT — Smith Welding Equipment Corp., Minneapolis 14, Minn. 68-page catalog 147 illustrates and describes Smith's line of equipment. Included are acetylene generators, general-purpose welders, welding torches, cutting tips, regulators and other equipment.

31 SURFACE HARDENING — Cincinnati Milling Machine Co., Cincinnati 9, Ohio. 20-page booklet M-161 covers the Cincinnati Flamatic hardening machine, which permits flame hardening of parts in production quantities.

32 HELIWELDING—Airco, 60 E. 42nd St., New York 17, N. Y. 8-page pamphlet ADG 2030 includes material on advantages, uses and equipment for Heliwelding, an inert-gas-shielded arc welding method.

33 WELDING WITH BRONZE ELECTRODES—Ampco Metal, Inc., Milwaukee 4, Wis. 24-page bulletin W-17 contains information on how to weld a variety of alloys using bronze arc welding electrodes.

34 ELECTRODES FOR STAINLESS OR ALLOY STEEL—Arcos Corp., Philadelphia 2, Pa. 10-page bulletin 1047 gives information on what electrode to use when welding stainless or alloy steel.

PLANT SERVICE EQUIPMENT

35 INDUSTRIAL TRUCKS — Elwell Parker Electric Co., Cleveland, Ohio. 78-page booklet in leather folder covers line of cranes, and lift-, tiering- and fork-type trucks. Diagrams and specifications are included.

36 FORK TRUCKS, TOWING TRACTORS—Clark Equipment Co., Battle Creek 67, Mich. 40-page catalog TC-7 includes information on gas and electric fork trucks and industrial towing tractors. Dimensional specifications are given.

37 LIFTERS — Economy Engineering Co., New York 17, N. Y. 32-page bulletin 48 covers their line of lifters giving mechanical data. Illustrations and specifications are included.

38 MATERIAL HANDLING — Service Caster & Truck Corp., Albion, Mich. 68-page catalog 46 gives specifications and information with illustrations on the company's line. Included are trucks, wheels, casters, tires, skids and pallets, and other equipment.

39 PERSPECTIVE DRAWING INSTRUMENT—Pomeroy Stereograph Co., Inc., Cleveland 14, Ohio. 8-page folder illustrates and describes the Pomeroy Stereograph which automatically and mechanically establishes the location of normal or accidental vanishing points.

40 MIMEOGRAPH DUPLICATOR — A. B. Dick Co., Chicago 6, Ill. 6 case histories, each in an individual folder, are representative cases of company's mimeograph duplicator in industry.

41 ELECTRODE WALL CHART — The Hobart Brother Co., Troy, Ohio. 25x35-in. electrode wall chart shows procedures for varied types of arc welding electrodes, actual results of too long or too short an arc, and other informative material.

PARTS AND MATERIALS

42 MOLDED SYNTHETIC-RUBBER PARTS—Allis Rubber Corp., Chicago 7, Ill. 32-page booklet, spirally bound, covers compounding, extruding, molding, inspection, laboratory work, and the various parts manufactured.

43 AUTOMATIC CONTROL — Westinghouse Electric Corp., Pittsburgh, Pa. 36-page booklet covers the Rototrol, an automatic control for electrical application. Control regulates voltage and current, controls speed, maintains constant tension and has other applications.

44 ROTARY PUMPS—Blackmer Pump Co., Grand Rapids 9, Mich. 40-page catalog 106 covers specifications and horsepower requirements for line of Blackmer pumps. Varied types of pumps such as hand, truck, and sanitary pumps are included.

45 BALL BEARINGS — The Fafnir Bearing Co., New Britain, Conn. 16-page bulletin contains material on the super-precision ball bearings built to ABEC 7 tolerances with emphasis on their use in spindles, work heads, and similar jobs.

46 THE METAL TANTALUM — Fansteel Metallurgical Corp., North Chicago, Ill. 20-page booklet includes the physical, chemical and electrical properties of Tantalum. Workability, weldability, machinability and fabricating techniques are discussed.

47 GEARS — Fairfield Mfg. Co., Lafayette, Ind. 16-page bulletin covers the type gears offered as well as the metallurgical, research and testing that is involved. Bulletin is illustrated throughout.

48 LOCKNUTS, LOCKWASHERS — Standard Locknut & Lockwasher, Inc., Indianapolis 4, Ind. 6-page bulletins 26 and 27 give complete specifications with detailed drawings of lockwashers and locknuts.

49 FERROUS METALLURGICAL CHART — Tempil Corp., New York 11, N. Y. Chart shows working characteristics of steels at temperatures from —300 to 2900 F. Important temperature zones are clearly defined. Ranges are shown in varied colors approximating the characteristic hot-body radiant hues.

50 VALVES — Parker Appliance Co., Cleveland 12, Ohio. 52-page catalog 301 lists engineering, specification, and application data with illustrations for all types of globe, needle, check, relief and plug valves made by Parker.

51 GEAR, SPEED-REDUCING PROBLEMS — D. O. James Mfg. Co., Chicago, Ill. 575-page catalog 1000 presents practical information which will assist in solving gear and gear speed-reducing problems. Contents includes engineering data, tables, hp. capacities, weights.

52 X-RAY MATERIALS — Eastman Kodak Co., Rochester 4, N. Y. 16-page bulletin F1-3 lists materials and accessories for industrial radiography. Listed are films, exposure holders, intensifying screens, chemical preparations and other equipment.

53 HYDRAULIC CYLINDERS — Hydro-Line Mfg. Co., Rockford, Ill. 26-page catalog gives with illustrations, specifications for entire line of cylinders. Cylinders range in size from 1¼- to 8-in. bore in various types of mountings.

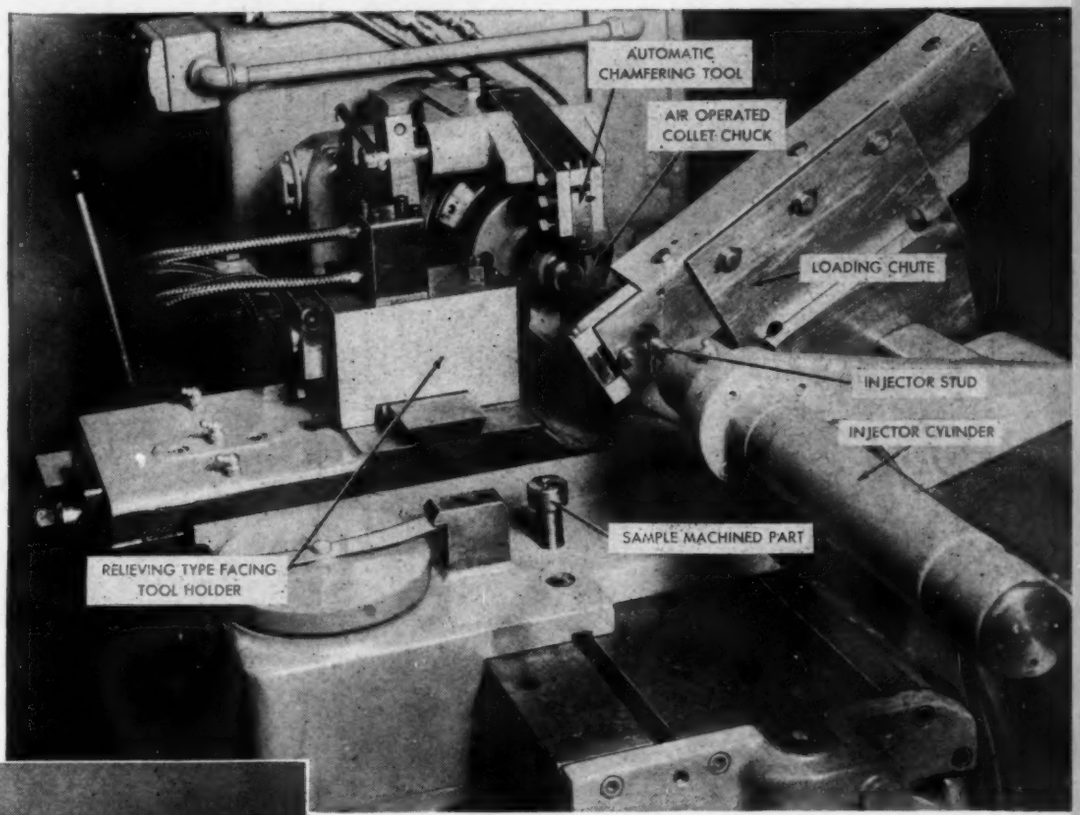
54 AIR CYLINDERS — Logansport Machine Co., Inc., Logansport, Ind. 14-page pamphlet 91 illustrates and describes stationary and rotating air cylinders and air-operated vises. Specifications are given.

MISCELLANEOUS

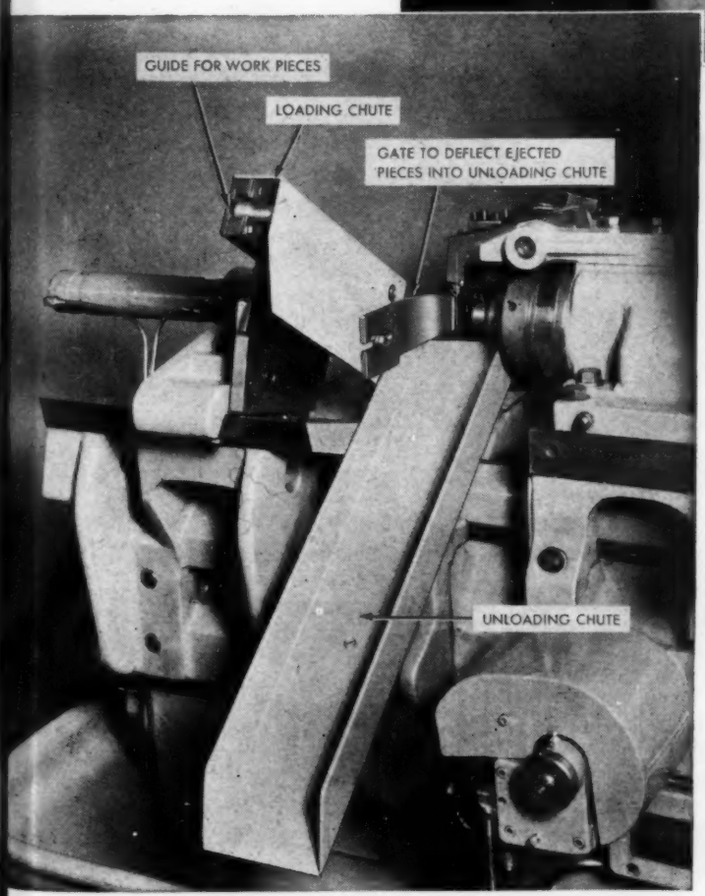
55 STANDARDS' LISTING — American Standards Assoc., New York 17, N. Y. 24-page catalog lists 874 standards. Revised standards approved since Jan. '47 are included.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



Automatic Loading enables the machine to produce to its full mechanical efficiency by eliminating the human equation.



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Problem: To finish face and chamfer bore of pump gear true with bearing diameter.

Solution: The Lo-swing IMP Lathe selected for this job was fitted with an injector type automatic loader which provides a very fast, completely automatic cycle, entirely eliminating hand loading and assuring a constant flow of machined parts at exceptionally low cost per piece.

The partially machined pump gears are placed in a loader chute and fed by gravity to the loader injector arm which picks up and places the part in an air operated collet chuck.

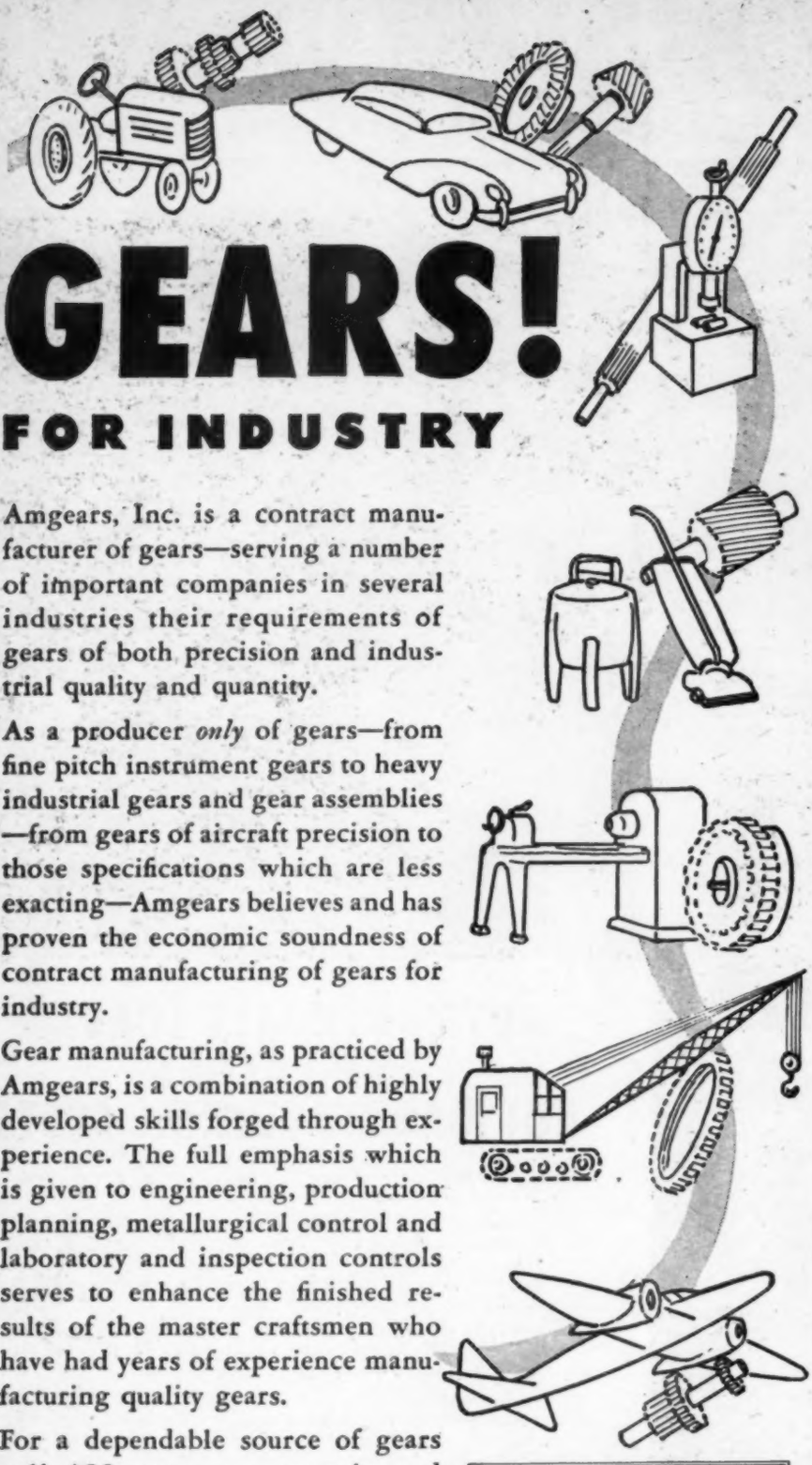
The facing operation is accomplished with a relieving type tool block mounted on the front slide. The tool is automatically relieved during the return stroke to avoid spiral tool marks. The chamfering operation of the bore is made with a swinging type tool block mounted on the headstock and automatically operated with a cam mechanism working in conjunction with the front cross slide.

On completion of the machining operation the pump gear is automatically ejected by a plunger located in the bore of the spindle after which the cycle is repeated.

Lo-swing Lathes fitted with Automatic Loaders are usually grouped together in series of two or more, since one operator can easily keep the loading chutes on several machines filled with pieces.

Seneca Falls engineers are always at your disposal to help find cost cutting solutions for your turning problems.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



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Amgears, Inc. is a contract manufacturer of gears—serving a number of important companies in several industries their requirements of gears of both precision and industrial quality and quantity.

As a producer *only* of gears—from fine pitch instrument gears to heavy industrial gears and gear assemblies—from gears of aircraft precision to those specifications which are less exacting—Amgears believes and has proven the economic soundness of contract manufacturing of gears for industry.

Gear manufacturing, as practiced by Amgears, is a combination of highly developed skills forged through experience. The full emphasis which is given to engineering, production planning, metallurgical control and laboratory and inspection controls serves to enhance the finished results of the master craftsmen who have had years of experience manufacturing quality gears.

For a dependable source of gears call AMgears—an experienced gear manufacturer.

Amgears also manufactures a complete line of Amtec Gear Tools, including spline arbors, gear chucks, master gears and spline gauges.

Write today for a copy of A CHECK LIST FOR THE GEAR BUYER—*no obligation.*

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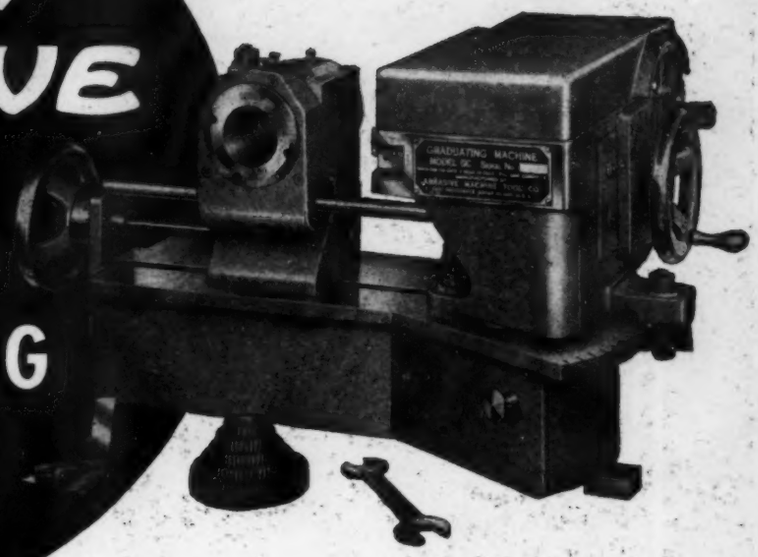
Announcing
ABRASIVE
MODEL GC
CIRCULAR GRADUATING MACHINE



The Model GC CIRCULAR GRADUATING MACHINE accurately and quickly graduates hand wheels, dials, knobs and similar parts. This machine is capable of a wide range in the *number* of possible graduations — including all commonly used English graduations, Metric graduations, and "Degree" graduations. The *type* of graduation can likewise be readily changed to conform with the requirements of any of these systems.

The actual cutting of the graduations is performed by a single-point tool which produces a clear, sharp line of almost any desired length or combination of lengths. Spacing of the graduations is controlled by a set of change gears and through a worm and worm wheel, assuring "Dividing Head" accuracy. Graduations parallel with the axis of the work and angular graduations up to 45° can be cut.

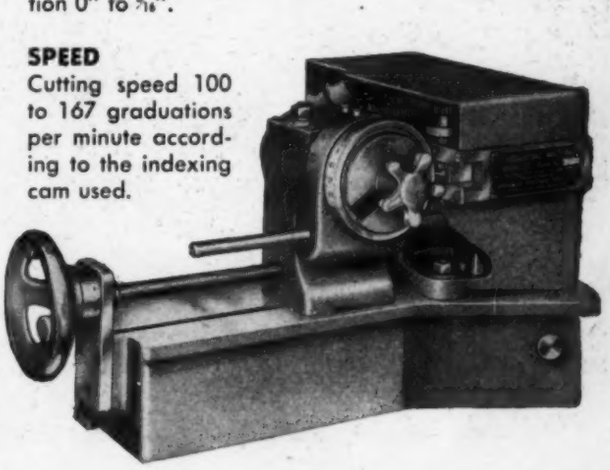
The unit is power driven which results in uniform, rapid production. Tests have shown that 55 handwheels, with 100 graduations on each, can be graduated in one hour. An automatic cut-out stops the machine at the end of each cycle so that after the setup is completed it is merely necessary for the operator to take off one piece and put on the next. To change the setup from one size and type of work to another is but a matter of minutes. It is only necessary to put on the proper change gears, the proper graduating cams and work holder, then set the depth of cut and proceed.

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, R. I., U. S. A.

SPECIFICATIONS

CAPACITY
Smallest diameter graduated with std. equip. 1½". Largest diameter graduated with std. equip. 20". Will graduate straight dials or angular dials up to and including 90° included angle. Maximum diameter for angular dials varies with the work, i.e. for 60° included angle, the maximum diameter is approx. 18"; and for 90° included angle, the maximum diameter is approx. 15". Length of graduation 0" to 5/16".

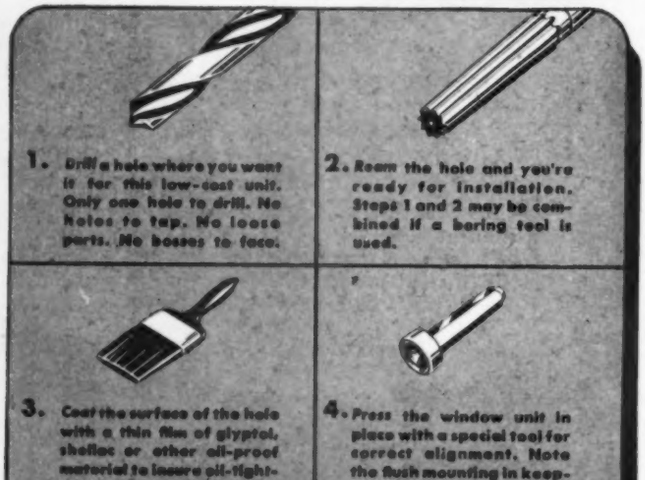
SPEED
Cutting speed 100 to 167 graduations per minute according to the indexing cam used.



Model GC machine set up to graduate an aluminum dial which has a knurled rim extending above the graduated surface.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Specify a self-contained ONE-PIECE window unit. No gaskets. No screws. No loose parts.


1. Drill a hole where you want it for this low-cost unit. Only one hole to drill. No holes to tap. No loose parts. No bosses to face.
2. Ream the hole and you're ready for installation. Steps 1 and 2 may be combined if a boring tool is used.
3. Coat the surface of the hole with a thin film of glyptol, shellac or other oil-proof material to insure oil-tightness.
4. Press the window unit in place with a special tool for correct alignment. Note the flush mounting in keeping with modern design.

. . . for indicating liquid level, flow or drip, and for observation of the position or movement of parts, such as gear mesh, timing marks, and other internal mechanisms.

BIJUR

BIJUR LUBRICATING CORPORATION
Long Island City 1, N. Y.

2388

KORFUND Vibration Control

Helps you 4 Ways

1. **Steps Up Production**—Often permits increased machine speeds—makes economical work-flow grouping of machines practical regardless of impact or vibration characteristics.

2. **Cuts Scrap Rate**—Isolation of impact and reciprocating machinery reduces work spoilage, prevents "chattering" and "bouncing" on work in process. Also protects precision tools against external vibration.

3. **Boosts Employee Efficiency**—Through relief from fatigue caused by vibration.

4. **Reduces Maintenance Costs**—Machines last longer; buildings last longer.

Korfund Vibro-Isolators are efficient, easy to install and adjust, and long-lived. They are sold on a "satisfaction guaranteed" basis.

Because Korfund utilizes all three isolation media—steel springs, cork, and rubber—recommendations are impartial—you get the medium or combination best suited for the job. And Korfund recommendations, whether for standard Vibro-Isolator Units or a specially-engineered installation, are backed by 45 years of experience.

"Vibration in Industry," a 12-page illustrated booklet now available, makes good profitable reading. We'll be glad to send you a copy.

The
KORFUND COMPANY, Inc.

KORFUND VIBRATION CONTROL

48-60 Thirty-Second Place
Long Island City 1, N. Y.

Vibration Control Specialists for Over 45 Years

CONTRACT WORK

Very best facilities for

STAMPINGS

IN SMALL LOTS

DAYTON ROGERS
Manufacturing Company

Minneapolis (7), Minn.

We Specialize in
—A-L-U-M-I-N-U-M—
If you have quantity parts to be MACHINED — POLISHED — ANODIZED *we can do it. Send for samples*
White Engineering Works, Inc.
Stamford, Conn.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them
GENERAL PATTERN WORKS
2233 Rurk Street Cincinnati, Ohio

ALMA WANTS YOUR BUSINESS

- Job Machining
- Production Machining
- Automatic Screw Machining
- Heat Treating—Welding
- Tools—Jigs—Fixtures—Gages
- Special Machinery
- Designing—Engineering
- Parts—Made to Order in Volume
- Products Wanted—To Manufacture
- Accurate Work—Prompt Delivery

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ALMA MOTOR COMPANY
OFFICE: 1434 NATIONAL BANK BLDG.
DETROIT 26, MICHIGAN
Telephone: Woodward 5-0643

KAMIS Engineering Company

Designers & Manufacturers of Tools & Machinery

Special machine work; facilities available for production quantities of small, medium and large machined parts, assemblies and fabrications. Specializing in stainless steel avaiation gas turbine parts.

Send for Brochure No. 3 which describes our facilities in detail.

300 MOORE STREET
PHILADELPHIA 48, PA.

THREAD GRINDING

Accurate Lead *Send Print*

Universal Thread Grinding Co.
579 Lafayette St., Bridgeport, Conn.

WANTED— A PRODUCT

Well known manufacturer of Textile and Knitting Machinery has available capacity for manufacturing an additional product, preferably one requiring precision machining.
Product should be completely designed and have a ready market with yearly sales potential in six figures.
Prefer to manufacture only, but may also consider marketing product.
Also have large available capacity for sub-contract work requiring precision machining and assembly.

FIDELITY MACHINE CO., INC.
Manufacturer of Precision Machinery for over 35 years
3908 Frankford Ave., Phila. 24, Pa.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : BUSINESS : "OPPORTUNITIES" : EQUIPMENT : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

60c per line, minimum 4 lines. To figure advance payment count 5 average words as a line.

Positions Wanted (full or part time individual salaried employment only) ½ the above rates payable in advance.

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Discount of 10% if full payment is made in advance for 4 consecutive insertions.

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An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

ENGINEER EXPERIENCED in estimating and designing of jigs, fixtures, and special machinery. Give full particulars in first letter. Location, Ohio, P-3871, American Machinist.

FACTORY MAINTENANCE Man, single, about 30, required for large South American cigarette factory. Must have machine shop experience and ability supervise native mechanics. Knowledge Spanish desirable but not essential. Good salary, vacation, and traveling expenses paid. State full particulars. P-3885, American Machinist.

ESTIMATOR

For Automatic Screw Machine Products. Must have jobbing shop experience on New Britain and Brown & Sharpe equipment. Prefer man who is now associated with a medium size aggressive organization. This is a permanent position with a nationally known organization located in Chicago, Illinois.

P-3758, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

SUBCONTRACT SALESMAN

Experienced, competent, personable, neat man wanted to sell excess machining capacity of machinery manufacturer.

FIDELITY MACHINE CO., INC.
3908 FRANKFORD AVE. PHILA. 24, PA.

SELLING OPPORTUNITY OFFERED

CUTTING TOOL Salesmen. New type end mill. Sells easily all shops. Must have allied lines. Excellent territories open. SW-3445, American Machinist.

SALES ENGINEER wanted—A large mid-western manufacturer of Speed Reducing Transmissions and Cut Gears, is seeking a representative for Detroit, Michigan, area on a commission basis. Must be experienced and financially responsible. Give full particulars in application. RW-3910, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 and up. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (38 years recognized standing and reputation). The procedure, of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Particulars on request. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

Additional Employment Advertising on page 234

SEARCHLIGHT SECTION

CHIEF ENGINEER WANTED

With minimum of 15 years experience in the manufacture of mechanical, electrical, photographic and optical devices. Must be able to assume full responsibility for tooling and production and coordinate with developmental and design department.

Company established 25 years, located in *Brooklyn and employing over 300 people.*

Give complete particulars regarding age, experience and salary expected.

BOX AM 4177
136 WILLIAM ST., NEW YORK 7

PROCESS & METHODS ENGINEER

Permanent position with well-known mfg. co. in western Illinois for A-1 man, 30 or over, experienced in routing & processing small precision machine items. Strong background in shop machines and tool & die work. M.E. degree useful but not essential. Salary open. State age, education, salary requirements, general background, & experience in full.

P-3934, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

Long established prominent manufacturer of tools and hardware offers real opportunity for qualified salesmen. Salary or commission basis to right parties.

SW-3969, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS WANTED

CHIEF ENGINEER or Assistant position. Twenty years diversified experience on industrial and consumer items. Designing, development, laboratory and project engineering. Electric appliances, motor driven tools, pneumatic equipment and intricate electro-mechanical devices. Wide experience in orginating and developing patentable items, modernizing existing lines and designing for practical production. Also have handled tool designing and production problems. Executive ability, college graduate, age 44. Write PW-3945, American Machinist.

MANUFACTURING AND Tool Engineer, 13 years broad experience in jobbing and manufacturing of radios, navigation instruments and cameras. Practical machine shop experience in screw machines, castings, metal stampings and assembly. Thorough knowledge of tools, dies, jigs and fixtures through personal use and designing. Medium background in plant layout, time and motion economy, and liaison man between engineering and manufacturing. Available as manufacturing and tool engineer or assistant to top production executive who wants practical results instead of theories. Now employed. Available 3 weeks after negotiations. Married, 32, PW-3935, American Machinist.

ENGINEER MECHANICAL. Graduate 36, Project Engineer with major aircraft company, 15 years experience in development autom. machinery, production tooling, automatic weld'g, hydraulic, pneumatic and el. controls, tieback mechanisms. 6 languages. Will travel some Relocate, References. PW-3880, American Machinist.

CHECKING, RESEARCH, new business development, or other engineering department work desired. Extensive experience on production methods, modern engineering department practice, standards, and follow-up of engineering projects. PW3868, American Machinist.

CARBIDE TOOL Engineer: Broad executive experience in carbide industry. Qualified carbide tool and die designer. Thoroughly familiar with manufacture of carbide. Thirteen years executive experience with leading carbide manufacturer. Desire sales or engineering connection with carbide manufacturer or large consumer. PW-3846, American Machinist.

SALES ENGINEER now employed as direct factory representative on special drilling, tapping and boring machines in Ohio and Indiana. Present employer will give excellent reference. Would appreciate personal interview. PW-3837, American Machinist.

FACTORY FOREMAN, Superintendent. 50. Direct supervision mfg. assembly, process planning, scheduling, tooling stamping, mass production, cost conscious. Anywhere. Moderate salary. PW-3785, American Machinist.

SELLING OPPORTUNITY WANTED

NEW ENGLAND Sales Organization with well-established industrial accounts can handle one more good line on straight commission. Address P.O. Box 838, Springfield, Mass.

BUSINESS OPPORTUNITIES

Mechanical Engineer
with 20 years shop, design and sales experience; wishes to invest $18-$20,000 in small going manufacturing business; where services can be utilized to advantage. BO-3754, American Machinist.

SALES REPRESENTATION—Sales executives with wide acquaintance among large and small industrial plants of Pennsylvania and Ohio are seeking sales agencies requiring high class sales and technical ability. Would also consider purchasing a well established business of this nature. BO-3844, American Machinist.

PATENT ATTORNEY

Patent Practice
before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys. Suite 453, 815-15th Street, N. W., Washington 5, D. C.

MARTIN-PARRY CORPORATION Offers for Sale:

1. Modern Industrial Plant, comprising 236,231 sq. ft.
2. Hotel, the West York Inn, plus auxiliary property.
3. Unimproved Industrial Plot, approx, 3 acres

Illustrated Brochure No. AMx571y on request. Exclusive Agents:

ALL AT YORK, PA.
48 mi. from Baltimore • 88 mi. from Philadelphia • 28 mi. from Harrisburg
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For inspection & particulars, consult:
ASSET REALIZATION CO.

ACTION! Asset Realization co. IN REAL ESTATE
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790 Broad St., Newark 2, N. J.

Business Opportunity
PRODUCT FOR SALE

Tools, material, work in process, packing material and some finished product will be sold as complete unit. Manufacture involves light metal stamping in aluminum and steel, assembly including installation of fractional horsepower motor. Item is a consumer article that is capable of developing large market in hands of capable merchandising organization.

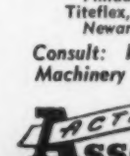
BO-3676, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FOR SALE
PRODUCTION LATHE

LeBlond 13" Rapid Production Lathe; complete with air chuck and air equipment. Excellent condition. Serial No. 13RP964.

J. P. DAVENPORT
126 N. Galt Ave., Louisville 6, Ky.

EXPERIENCE
IS THE BEST TEACHER especially in MACHINERY APPRAISALS



ACTUAL EXPERIENCE gives you accurate figures—on cash value . . . going concern value . . . replacement value. Our appraisals draw upon the experience of men who have sold millions of dollars worth of machinery, inventories and plants . . .

RECENT APPRAISALS
New Process Gear Corporation, *Syracuse, New York*
Edison-Splitdorf Corporation, *New Jersey & Pennsylvania*
Messinger Bearings, Inc., *Philadelphia, Pennsylvania*
Titeflex, Inc., *Newark, New Jersey*

Consult: Paul Kifner, Vice-Pres. Machinery and Plant Department

ACTION! Asset Realization co. IN INDUSTRY
14 Church Street, New York 6, N. Y.

WILL TRADE

Have a number of 1" 6 spindle type RA *National Acme Automatics like new will trade for following;* 36" Van Norman *milling machine, Do all Saw, 42" Bullard,* 2A Warner & Swasey, #4 *milling machine, horizontal boring machine*—must be in good condition as our automatics.

NYLEN PRODUCTS COMPANY
ST. JOSEPH, MICHIGAN

WANTED
HYDRAULIC PRESS

100 to 200 ton, upstroke or downstroke, platten size approx. 24" x 24".

JUDSON BROS. CO.
COLLEGEVILLE, PENN.

WANTED

Bullard Vertical Turret Lathe 42" Spiral Drive—Prefer Serial No. above 22,000.

WESTBROOK ELEVATOR MFG. CO.
Danville, Va.

WANTED
USED DROP HAMMER

About 300 to 500# for making drop forging Plyers.

KLUGLEIN
Valley Stream, N. Y. Tel. V. S. 5-9388.

WANTED

Eyebender—Automatic Grinder—Die and Tool—Surface Magnetic Chuck—6"x12"—up to ½" to ¾".
Drill Press — High Speed — up to ½" to ¾".

Kewaunee Engineering Corporation
Kewaunee, Wisconsin

PUNCH PRESSES WANTED

Toledo—Bliss #1 Deep Gap Single Geared
Ferracute—#C92 External Notching

BROWNING MFG. COMPANY, INC.
Maysville, Kentucky

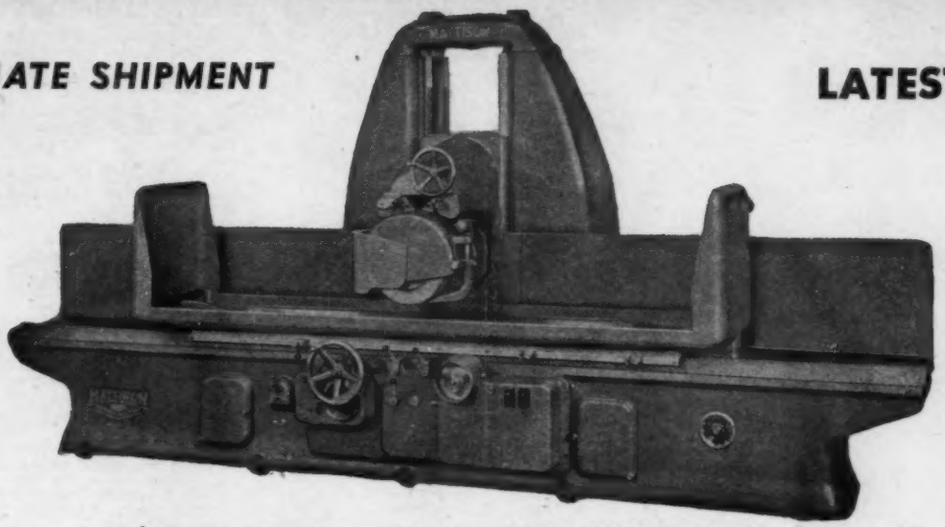
WANTED

4—3¼" Single Spindle Gridley Screw Machines. Prefer Machines factory arranged for motor drive. Must be priced right.

W-3947, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

LATEST TYPE NEARLY NEW MACHINES

IMMEDIATE SHIPMENT **LATEST TYPE**



MATTISON—14x16x60" High Powered Precision Surface Grinder—Hydraulic

Equipped with guards, pumps, tank, piping, diamond holders. Arranged for motor drive with motors and electrical starting equipment.

BORING MILLS—Horizontal

DETRICK & HARVEY 4", 5" bar, Floor Type
GIDDINGS & LEWIS #25—2¾" bar, Motor Drive
GIDDINGS & LEWIS #32—3¼" bar, latest type
LANDIS #35 3¼" bar, Floor Type
NILES BEMENT POND 4¼" bar, Motor Drive
NILES BEMENT POND 5", 6", bar, floor type
UNIVERSAL 3" bar, latest type

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
Bullard 24", 36" Vertical Turret, New Era, Motor Drive
BULLARD 16"—6 spindle Mult-Au-Matic—Type D—Single indexing—Latest Type
BULLARD 36" Ver. Turret, spiral drive, latest type
KING 42", 2 swivel heads, Latest Type
KING 36" Vertical Turret, M.D., Latest Type
NILES 84", 100", 120", 2 swivel heads, Power Rapid Traverse, Motor Drive

BROACHES

LaPOINTE 4L, Horiz., hyd., latest type
LaPOINTE #SRV-25-66, 10-54, Vertical Surface, hyd., latest type

GEAR CUTTING EQUIPMENT

BARBER & COLMAN #3 hobber, latest type
FELLOWS 61, 615A, 645A3, 7, 7A, 72, 75A, 77, High Speed Gear Shapers, latest type
FELLOWS 12M Involute Measuring Instrument, Latest
FELLOWS 6Z2 Gear Shaper, High Speed, Latest Type
FELLOWS 13 LS Lapping, Latest Type
GOULD & EBERHARDT 12H, 36H, Hobbers, latest type
GOULD & EBERHARDT 12HS Hobber, latest
GLEASON #7, Spiral, Bevel, Hypoid, Zerol, Latest
GLEASON 36" Straight Bevel Gear Planer, Motor Drive
GLEASON 9", 12" Straight Bevel Generator, Latest
PRATT & WHITNEY 10" Grinder, hyd., latest
PFAUTER No. 1, 2, with Differential, Motor Drive

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3x12, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, latest type
LANDIS 6x18 Type "C", hyd., latest type
LANDIS 30x220" Plain, Roll, Motor Drive
NORTON 16x72" Univ., Hyd., Type C, latest
NORTON 16x72" Plain Type "C", latest type

GRINDERS—Surface

BLANCHARD #11—16" chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
BLANCHARD No. 16A—Dial Type—motor drive
GALLMEYER & LIVINGSTON #35, 8x24" Hyd., latest
GALLMEYER & LIVINGSTON #55, 12x36" hyd., latest
HEALD 25A Rotary, 16" chuck, latest type
HEALD #22, 12" chuck, Rotary, latest type
MATTISON 12x16x60 Hydraulic, latest type
MATTISON 20"x24"x72" Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type
THOMPSON 16x30x48 Hyd., Latest Type

JIG BORER

PRATT & WHITNEY 3B, Motor Drive, latest
REED PRENTICE #5, Die Sinker, Timken, Latest

LATHES—Engine and Mfg.

BETTS BRIDGEFORD 60"x14" centers, raised to swing 84", Power Rapid Traverse, Motor Drive
BRIDGEFORD 36"x28', 36"x32' bed—2 car., M.D.
JONES & LAMSON "Fay" 20x25" automatic, TIMKEN, latest type
LEBLOND 17"x5', 20"x10' bed, Rapid Production, Timken Bearing, latest type
LEHMAN 16x30" centers, hydratrol, TIMKEN, latest
LODGE & SHIPLEY 16/20"x30" centers, Timken bearing, latest type
LODGE & SHIPLEY 18"x72" centers, geared, Motor Drive
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers, latest type
MONARCH 10x20" centers Model EE, Timken, latest
MONARCH 12"x30" centers, Timken, Latest type
NILES 42"x60", double head, motor drive
NILES 48x35' centers, Heavy Duty, 2 carriage, Timken Bearing, PRT, Latest Type
NILES 60x10', 35', centers, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 72"x62' centers, combination Boring and Turning, Motor Drive
NILES 30x50' Boring, Timken, Latest Type
REED PRENTICE 16x24" centers, geared, M.D.
SPRINGFIELD 14"x43" centers, geared, M.D.
SPRINGFIELD 16"x24" centers, geared, M.D.
SPRINGFIELD 16"x30" centers, Timken, Latest Type
SUNDSTRAND 8x15", stub, auto. TIMKEN, latest

LATHES—Turret

BARDONS & OLIVER #5, 7, universal, Timken, latest
CINCINNATI ACME No. 1, Latest Type
GISHOLT #3, 4, Univ., Timken, Latest Type
GISHOLT #1L, #2L Universal, Timken, Latest
JONES & LAMSON #3, 8A, Universal, Timken, Latest
LIBBY 1H-5, 5½ hole, Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken, latest
POTTER & JOHNSTON #5D2E, TIMKEN, latest
WARNER & SWASEY 3A, Universal 6" bar capacity, Timken Bearing, Latest Type
WARNER & SWASEY #5, Univ., Timken
WARNER & SWASEY #1A, Univ., Latest Type

MILLING MACHINES—Mfg.

CINCINNATI, 24", 48" duplex, TIMKEN, M.D.
CINCINNATI 3-24 Duplex Hydromatic, latest type
INGERSOLL 42"x38"x12' Planer Type, Adjustable Rail, A.C., Motor Drive
INGERSOLL 32"x30"x12' Combination Slab, Motor Drive
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
SUNDSTRAND Model 3A Duplex, Latest Type
TAYLOR & FENN M-80 Duplex, Spline, latest type

MILLING MACHINES—Plain

BROWN & SHARPE #12 Timken Bearing, latest
BROWN & SHARPE #3B, Timken Bearing
CINCINNATI 1-12, Timken, latest type
CINCINNATI 4-36 Hydromatic, latest type
CINCINNATI #4 Dial Type, Timken, latest type
CINCINNATI #3, 4 Timken Bearing, M.D.
CINCINNATI #3, 4S, 5—Motor Drive
CINCINNATI 0S Automatic rise and fall, Timken, Latest Type
KEARNEY & TRECKER #4 heavy, TIMKEN, latest
KEARNEY & TRECKER 1218, Simplex, Timken bearing, latest type
KEMPSMITH #2, #4, Timken, latest type
SUNDSTRAND #2 Electro-Mil, Timken, Latest

MILLING MACHINES—Vertical

CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
CINCINNATI No. 3, No. 4 High-Powered, M.D.
GORTON #9J superspeed, with duplicator, latest
GORTON 8D, Super Speed, with Duplicator, Latest
REED & PRENTICE 3VG with Hydraulic Duplicator Timken Bearing, latest type

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84x84x18', 4 heads, DC, M.D.
GRAY 36"x36"x8', 2 heads, maximum duty, D.C., Motor Drive
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC, M.D.

PRESSES

BIRDSBORO 325 ton, Vertical, Hyd., Latest Type
CLEARING Type DS-1125-32, Double Action, 125 ton, Latest Type
FERRACUTE DG-55, 75 ton, Drawing, Latest Type
GLEASON 15" Quenching, Motor Drive
NILES 200 ton, Horizontal Wheel, Motor Drive
WATSON STILLMAN, 20 ton, Hyd., strgt'g., Latest

MISCELLANEOUS

BARNES #172, 306H Vertical Hone, Latest
LANDIS 1" Bolt Threader—Latest Type
MORTON 60" traveling head, planer, miller and driller
MORTON 48" Draw Cut Shaper, Motor Drive
PRATT & WHITNEY "Keller" Type G, Type BL2416—Latest Type
JONES & LAMSON 6x15", 8x48" thread grinders, Latest type

Available for Prompt Shipment • Most Built After 1941

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

MOREY MACHINERY CO., INC.
410 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

LATHES

14"x6' Hendey
15"x5' Sebastian
18"x8' American
20"x10' Lodge & Shipley
22"x48" centers Monarch (1942)
36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
50"x17' centers LeBlond (1942)

8"x15" Sundstrand, Model D (1943)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

MILLING MACHINES

No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2-18 Cinn. Rise & Fall (1941)
No. 2—18" Sundstrand Electromil (1942)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Plain Hydromatic (1942)
No. 45-48 Cinn. Hyd. Duplex Tracer (1943)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hyd. (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
12"x54" Lees-Bradner—Model HT (1943)
4" Taylor & Fenn Spline, M.D.
Ingersoll Traveling Column Miller
24"x24"x12' Ingersoll Adj. Rail
54"x36"x10' Ingersoll Adjustable Rail
72"x48"x12' Ingersoll Adjustable Rail

Re-MANUFACTURED MACHINE TOOLS
Reg. U.S. Patent Office

DRILLS

No. 121 Baker
No. D-8 Colburn No. 6 M. T.
No. 3MS—24"—1 Spdl. L.G.
No. 2LMS—20"—2 Spdl. L.G.
No. 2LMS—26"—2 Spdl. L.G. (1945)
No. 2LMS—26"—4 Spdl. L.G.
24"—4 Spdl. Demco
No. 3B—24"—6 Spdl Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

VERT. BOR. MILLS

34" King
42" Bullard New Era
52" King
72" Cincinnati
72" Niles Extra Heavy
84" Betts

HOR. BOR. MILLS

No. 3A Universal, 3" Bar
Rockford, 3⅛" bar
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

JIG BORERS

Model B Kearney & Trecker Autometric (1943)

GEAR MACHINES

No. 615-A Fellows Gear Shaper (1942)
No. 7 Fellows Gear Shaper
No. 71 Fellows Gear Shaper (1942)
No. 7125-A Fellows Gear Shaper (1942)
11" Gleason Bevel Gear Cutter

MISCELLANEOUS

Model H-7 Micromatic Vert. Honer
No. 22-C Racine Shear Cut Hack Saw

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 601 Oster Rapiduction (1942)
No. 3 Bardons & Oliver, Bar fd. (1942)
No. 4 Gisholt (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
No. 2-A Warner & Swasey
No. 6R Denver, A.C. & Bar feed
No. 21-B Bardons & Oliver (1945)
No. 1-H Libby, 8¼ Hole in Spindle (1937)
18" Libby, 3½" hole in spindle

GRINDERS

4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"x36" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"

10"x24" Landis Type C Universal
12'x36" Landis Type LCH Universal (1945)

No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)

72A-3 Heald Internal Grinder
10"x72" Colonial Broach Grinder
No. 5—18" Besly Disc Gdr.

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BLVD. **CHICAGO 6, ILL.**

LATE MODELS OF MACHINE TOOLS FOR EARLY DELIVERY

BORING MILLS

36", 42" & 54" BULLARD Vert., M.D. Spiral Drive
#360-F GIDDINGS & LEWIS, Floor Type M.D.
#560-F GIDDINGS & LEWIS, Floor Type, M.D.
#44 UNIVERSAL Tri-Way, Table Type

GRINDERS

#2 B&S and REID Surface, M.D.
A3-16" ARTER Rotary Surface Grinder
#10 B&S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
9" P&W Hyd. Gear Grinder, M.D.
#11 BLANCHARD Rotary, 16" chuck
4—#4H LANDIS 4"x18" Plain Grinders, M.D. with hyd. straight infeed, hyd. timer & hyd. footstock
6"x18" NORTON & LANDIS Type C Plain
6"x30" NORTON Type C Plain Cyl.
14"x36" LANDIS Type C Plain
24"x96" NORTON Plain, M.D.

LATHES

AMES Precision Bench Lathe, 1" collet cap., M.D.
12"x6' LODGE & SHIPLEY G.H. Lathe
14"x30" c.c. LEBLOND HVY DUTY, M.D.
16"x54" c.c. LEBLOND HVY DUTY, M.D.
16"x6' SEBASTIAN LATHE, M.D.
50"x17' c.c. LEBLOND "BIG SWING" Lathe, M.D.

MILLING MACHINES

#5/60 CINCINNATI Duplex Hydromatic Milling Machine, tracer control mechanism for automatic rise and fall of spindle carriers, M.D. machine used six months.
#08 CINCINNATI Hor. & Vert. Millers
#12 B&S Prod. Mills, M.D.
#2—24 CINCINNATI Auto. Millers
1224 K&T Simplex, M.D.
#1G & 2G KEMPSMITH All Geared Univ. M.D.
#12 VAN NORMAN Universal Miller, M.D.
#2H K&T Vertical, Power Feed, M.D. (3)
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type Plain, M.D. (2)
#4K K&T Plain, M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#12M MOREY 2-spdle Profiler, M.D.
#12B P&W 2-spdle PROFILERS, M.D.

TURRET LATHES

#0 B&W Wire Feed Screw Machines, M.D.
#2G MOREY Ram Type, M.D.
#3 GISHOLT Ram Type Univ., M.D.
Nos. 3, 4, & 5 W&S Ram Type Univ., M.D.
Nos. 3 & 5 J&L Ram Type Univ., M.D.
#4A W&S Saddle Type Univ., M.D.

DRILLS

6-spdle ALLEN Drill, 5 powerfeed spindles
3'9" CINCINNATI BICKFORD "Super Service" Radial

MISCELLANEOUS

#36H GOULD & EBERHARDT Gear Hobber
Used Bases for 4' & 6' CINCINNATI BICKFORD Radials
#4—48" B&S Gear Cutter
40"x32"x51" OHIO Tilting & Revolving Rotary Table for Horizontal Boring Mill
14" STEPTOE Shaper, V-belt, M.D.
V-16 DOALL Contour Saw, M.D.

WIGGLESWORTH MACHINERY CO.

203 BENT STREET **Kirkland 7-5242** **CAMBRIDGE, MASS.**

Bor. Mill Hor. 5" G & L, M.D.
Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W. & S., S.P.D.
Millers, Plain No. 3 K & T, No. 4 Cin.
Millers, Vertical No. 3 B & S & No. 4 Cin.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.

West Penn Machinery Company
120 House Bldg. Pittsburgh, Pa.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

MONA MEWOOD

B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

ENGINE LATHES

32"x28' Bridgeford Grd. Hd. 20' centers, M.Dr.
32"x16' Bridgeford Grd. Hd. 110" centers, M.Dr.
24"x22' Lodge & Shipley Grd. Hd. 14' centers, M.Dr.
24"x18' American Grd. Hd. 11' centers, M.Dr.

TURRET LATHES

#2G Morey Grd. Hd. Bar feed, M.Dr., Late Type.
#4 Warner & Swasey Univ., Bar Feed, M.Dr.
#2 Simmons "Microspeed" Grd. Hd. Bar feed, Late Type.
Hardinge High Speed Second Operation Machine, M.Dr., 1" collet capacity.
#3 Jones & Lamson Universal Ram Type, M.Dr., Late Type.

DRILLING MACHINES

Nateo #12, 20 Spindles, 3/16" cap.
Nateo #D6, 24 Spindles, 5/16" cap., M.Dr.
Nateo #D5, 14 Spindles, 5/16" cap., M.Dr.
Fox #15, 54 Spindles, #1 M.T.
Minster #2D S. Spdle. Upright, Heavy Duty with compound table.
#5 M.T. Spdle.
Cinci-Bickford 3½' arm, 9" col. Radial.
Cinci-Bickford 4' arm, 11" col. Radial.
Cinci-Bickford 5' arm, 14" col. Radial.
Cinci-Bickford 6' arm, 15" col. Radial.

POWER PUNCH PRESSES

Michigan 36 tons O.B.I. 2" stroke.
General 8 tons Flexible Power Press, M.Dr.
Clearing 200 tons, S.S. 10" stroke.
Ferracute #EG52 Geared Coining Press, 150 tons cap., Upmoving ram.
Zeh & Hahneman, Single Action Cam Press, spring return type, 35 tons.
Hub, O.B.I. 15 tons Bench Model, 2" stroke, 7¼" shut height, M.Dr.
Bliss #18 O.B.I. 11 tons, 2" stroke.

MILLING MACHINES

#2-20 Kent-Owens Hydraulic, M.Dr.
#3 Cincinnati H.S. Dial Type Vertical, M.Dr., With Rotary Table & Duplicator Attachment.
#0/8 Cincinnati Plain Automatic, M.Dr.
#1/12 Cincinnati Plain Automatic, M.Dr.
#5 Cincinnati Horiz. High Power Mill, M.Dr.
#4 Cincinnati Vertical High Power Mill, M.Dr.
#2 Cincinnati Universal Horiz. Mill., M.Dr.
#2B Milwaukee Dbl. Overarm Univ. Mill.

FALK MACHINERY COMPANY
18 Ward St. **Main 6347-48**
Rochester 5, New York

EASTERN REBUILT MACHINE TOOLS

LATE TYPE - PROMPT SHIPMENT

VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head (4)
36" Bullard New Era, m.d., with side head
36" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head, latest type
42" Bullard New Era, m.d., with side head
42" Bullard Spiral Drive, m.d., with side head
42" Colburn, m.d., 2 swivel heads
48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
48" Colburn, m.d., 1 turret, 1 swivel head
48" Putnam H.D., m.d., 2 swivel heads
54" Colburn H.D., m.d., 1 turret, 1 swivel head
84" Niles H.D., 2 swivel heads
100" Niles H.D., m.d., 2 swivel heads

BROACHING MACHINES

Colonial VAS-5-42 Single Ram Hydraulic Vertical, 42" stroke, 5 tons
No. 75 H.P. LaPointe Horizontal Hydraulic, 37½ tons pull, maximum stroke 150", very late type
Cincinnati Mill Broach, 10" spindle, new
Oil Gear Hydraulic, type XA, 64" stroke, 17½ tons pull
No. 4 LaPointe of Hudson, gear box

BALL BEARING DRILLS

No. ½, 1, 2 Avey S.S., m.d.
No. 1B Edlund, m.d., new
No. 2½ Allen, m.d., 4 speed
No. 5M—16" Fosdick, 4 speed
Providence Eng. Co. Model E, gear box
2 spindle No. 2 Avey MA6, m.d., p.f., latest
2 spindle No. 2 Avey, m.d., p.f.
2 spindle 21" Canedy-Otto, m.d., p.f.
2 spindle No. 3 Edlund, m.d., latest
4 spindle No. 2 Avey MA6, m.d., latest
3 spindle No. 3 Avey, m.d., p.f.
3 spindle No. 2 Motor Avey, m.d., latest
4 spindle No. 2 Avey, m.d.
4 spindle Gardam, belt

HORIZONTAL DRILLS

No. 1B—50" Pratt & Whitney Deep Hole, m.d., latest
No. 1 Pratt & Whitney 2 spindle Deep Hole, m.d.
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole, m.d., latest
Pratt & Whitney Rifling Machine, belt
5 spindle Detroit Semi-Automatic, belt

AUTOMATICS

4 spindle ⅞" Acme-Gridley Automatic, m.d.
4 spindle ⅞" Cleveland Model M, bar, m.d.
4 spindle 2" Cleveland Model M, m.d., bar
4 spindle 2¼" Cleveland Model K, m.d., bar
2¼" Gridley Single Spindle, m.d., bar
2¼" Cleveland Model A, m.d., bar
2½" Cleveland Model A, m.d., bar
4¼" Cleveland Model A, m.d., bar
4½" Cleveland Model A, m.d., bar
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7¾" Cleveland Model A, m.d.
No. 6A Potter & Johnston, m.d., chucking
No. 6C Potter & Johnston, m.d., chucking
Jones & Lamson 20x25", m.d., late
14" Fay, m.d., Flanders Type

BOLT THREADING MACHINES

¾" Economy Automatic Threading, belt
3 spindle 1¼" Acme, cone
2 spindle 1¼" Landis, m.d.

HORIZONTAL BORING MILLS

2½" Cleveland, m.d.
No. 31 Lucas, 3" bar, m.d.
No. 32 Lucas, 3½" bar, m.d.
No. 33 Lucas, 4½" bar, m.d.
3½" Cincinnati-Gilbert Floor Type, m.d., latest
4" bar Detrick & Harvey Floor Type, m.d.
4" Niles, table type, m.d.
4½" Niles, table type, m.d.
5½" Niles, table type, m.d.
10" bar Sellers Floor Type, m.d., no floor plate
Morton 60" stroke Horizontal Boring, Milling and Drilling and Draw-Cut Traveling Head Planer, m.d.

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head, 15 spindles
D13H Natco Hydraulic, m.d., head 18x12", 10 spindles, tapping
No. 16 Fixed Center Foote-Burt, 8 spindles
3 spindle 12" Rockford Gang, m.d.
4 spindle 21" Cincinati-Bickford Gang, d.c. motor
4 spindle Foote-Burt Rail, m.d.

RADIAL DRILLS

3' American Sensitive, belt
4' American Sensitive, d.c. motor on arm, inclosed head
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, 13" col.
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm
5' Cincinnati-Bickford Full Universal, gear box
5'-13" Cincinnati-Bickford Plain, m.d.
5' Prentice Plain, m.d.
6'-15" Carlton Plain, gear box
6' Cincinnati-Bickford Plain, m.d. on base
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western Plain, m.d.
8'-19" American Triple Purpose, d.c. motor on arm, 1942 machine
8'-16" American Triple Purpose, m.d. on arm
10'-22" American Triple Purpose, d.c. motor on arm p.r.t.

UPRIGHT DRILLS

21" Cincinnati-Bickford Super-Service, m.d.
28" Cincinnati-Bickford, m.d., tapping
30" Rich H.D., m.d.
32" Aurora, belt
40' Aurora, m.d.
H3 Barnes Hydram, m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., m.d.
No. 25 Foote-Burt H.D., m.d., compound table
No. 36 HO Baker H.D., m.d., 40" circular table, latest

GEAR SHAPERS

No. 6, 61 Fellows, belt
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61A, 65A3, 615A, 645A3 Fellows, m.d., latest types
No. 64-S Fellows, m.d.
No. 71A Fellows, m.d.

GEAR GRINDING MACHINES

No. 13LS Fellows Lapper, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d.

GEAR HOBBING MACHINES

No. 12H Gould & Eberhardt, m.d.
No. 24H Gould & Eberhardt, m.d.
No. 12 Barber-Colman Long Bed Type, m.d.
Type A Barber-Colman, m.d., latest
Type T Barber-Colman, m.d., latest
No. 34, 44 Brown & Sharpe, m.d.
48" Cleveland, m.d.

GEAR CUTTING MACHINES

No. 3—26" Brown & Sharpe Spur, m.d.
No. 6—60" Brown & Sharpe Spur, m.d.,
Cross Gear Tooth Rounder, m.d.
3 spindle No. 36BM Gould & Eberhardt Vertical Rougher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
National Broach & Machine Co. Gear Tester
3" Gleason Straight Bevel Gear Generator, m.d.
8" Gleason Mfg. Type Straight Bevel Gear Generator, m.d.
11" Gleason Straight Bevel Gear Generator
12" Gleason Straight Tooth Bevel Gear Generator, m.d.
Cincinnati Gear Burnisher, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.

CENTERLESS GRINDING MACHINES

No. 2 Cincinnati, Filmatic Spindle, m.d., late
No. 2 Cincinnati, m.d., older type
No. 3 Cincinnati, Filmatic Spindle, m.d., long bar attachment, late
Cincinnati Valve Seat Grinder, m.d., cap. ⅜" valve stems

CYLINDER GRINDING MACHINES

No. 50 Heald Hydraulic, m.d., new, latest type
No. 55 Heald, m.d.
No. 73 Heald Airplane Cylinder Grinder, m.d., new, latest type

SHEET METAL MACHINERY

No. 1 Savage Nibbler, roller die type, m.d., cap. ¼"
Southwark Rotary Metal Cutter, m.d., cap. ⅜" material
Gray Turret Head Metal Cutter, cap. ¼", m.d.
120" No. 100 Niagara Heavy Production Folder, m.d., cap. 16 ga.

MISCELLANEOUS

Pratt & Whitney Keller Machine, type BL-2420, late
Gisholt Precision Balancing Machine, m.d.
40" Tolhurst Chip Wringer, m.d.
No. 2 Cochran-Bly Filing Machine, m.d.
No. 11 Cochran-Bly Saw Sharpener
No. 12M Morey 2 spindle Profiler, m.d., latest
No. 12 Pratt & Whitney 2 spindle Profiler
Wagner Saw Sharpener, m.d., 42" cap.

Every machine listed is our property and on our warehouse floor in Cincinnati.

The ABOVE IS ONLY A PARTIAL LISTING. WRITE US YOUR NEEDS. LET US QUOTE.

THE EASTERN MACHINERY COMPANY
1034 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS
EMCO

Snowed Under

by Machine Tool Problems?

LATHES

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D. AC elect. equip. power rap. trav. to carr., compound rest, 2 steady rests, sw. 38" over bed, 26" over carr., dist. betw. cens. 48', mtzd. apron and taper attmts.

Hendey 12", 14" 16" and 18" Tool Room Lathes, M.D., 6', 8' and 10' beds.

1—Bridgeford 36"x14' Heavy Duty Eng. Lathe, 9 spds., Gear Hed., AC motor driven, dist. betw. cens. 7' 6", sw. 38½".

L. & S. 27½"x16' Eng. Lathe. sw. over ways 28", sw. over carr. 19½", dist. betw. cens. 10', diam. of tailstock 3½" dbl. bk. grd., motor driven.

UNIV. MILLERS

2—B & S #2A Univ. Mill. Machines; tbl. wkg. surf. 45"x11⅛"; feeds-long. 28", cross 10", vert. 18".

1—B. & S. #3A Univ. Mill. Machine, motor in base, tbl. overall 57½"x13¼", feeds long. 34", cross 12", vert. 19".

1—Van Norman #2SU Univ. Mill. Machine, hor. knee type, very latest type, tbl. wkg. surf. 50"x12", feeds long. 24¼", cross 10", vert. 17", motor driven.

VERT. MILLERS

1—Milwaukee #2K Vert. Milling Machine; tbl. wkg. surf. 56"x12"; range long. 28", vert. 14", cross 12", spdle speeds 24, range 15 to 750 RPM, latest type.

1—Milw. #4H Vert. Miller, tbl. wkg. surf. 74"x15½", feeds: long. 42", cross 14", vert. 16", motor driven, very latest type.

1—Cin. 28"x60" Vert. Hydro-Tel Milling Machine very latest type, tbl. wkg. surf. 28"x83"; range: long. 60", cross 24", vert. trav. of spin. hed. 14"; power rapid trav.

HORIZ. MILLERS

3—Cin. No. 2M Constant Speed Drive, Pl. Horiz. Millers, tbl. wkg. surf. 40"x10½", range: long. 28", cross 10", vert. 19", 12 spin. speeds, 20-419 RPM.

2—Cin. #3 Hor. Dial Type Millers, latest type, tbl. wkg. surf. 58¾"x15", long. feed 34", cross 12", vert. 20", spindle speeds 16-450 RPM.

1—B. & S. #2B Hor. Miller, long. feed 28", cross 10", vert. 18½", tbl. wkg. surf. 51¾"x 11-11/16"; spdle speeds 30-1200 RPM, late type.

RADIAL DRILLS

1—American 5' 13" Full Universal Radial Drill 24 speeds, motor driven, No. 4 Morse Taper, tumbler gear box, M.D.

Cin. 5' 13" and 6' 15" Pl. Radial Drills, 24 spin. speeds, No. 5 Morse Taper, tumbler gear box, M.D.

Fosdick "Economax" 4' 13" col. Radial Drill; 36 spin. speeds, range 14 to 1010 RPM, No. 5 Morse Taper; motor driven.

Cincinnati-Bickford 5' 17" col. Super Service, motor-on-arm Radial Drill; 36 spindle spds, range 26-1572 RPM, 18 feeds, latest type.

PRESS

1—Farquhar 100 Ton Hyd. Press, daylight 48", stroke 36", approach and return speed 1600' per min., given maximum variation 5 degrees, wght. 44,000 lbs., elect. equip. 440/3/60, condition equal to new.

HAMMERS

1—Standard Mchy. No. 8, 800 lb. Automatic Hammer.

Bradley 150 lb. Strap Hammer and 300 lb. Upright Helve Hammer,

Chambersburg "Cocoiley," Mod. J2, 5000 lb. Board Drop Hammer, motor driven, new in 1944.

CHUCKING MACHINES

1—Cleveland 6½", Mod. K, 4 spin. Chuck, Machine, with air chucks, motor drive and equip.

Potter and Johnson 5D Auto. Chuck. Mach. sw. over bed 25", sw. over cross slide 12", total turret slide travers 13", M.D., with tooling.

AUTO. SCREW MACHINES

B. & S. #2 Hand Screw Mach., turns any length to 6", whole thru longest regular feeding fingers 1"—thru spindle 1-9/16", spindle speeds 580-2485 RPM, latest type.

Complete Your Machine Tool File. Send for our Catalog. Write, wire or phone Worcester 6-5175.

Botwinik Brothers of Mass., inc.

3 SHERMAN ST. WORCESTER 3, MASS.

MILES' QUALITY

Automatic, 2⅝" Acme Gridley 6 spindle, model RA6 with accelerated reaming in 4th & 5th positions and quite a little equipment. Serial No. 84243. New 1941.

Automatic, 1⅝" New Britain 6 spindle, model 61 with several sets of collets and tooling. New 1942 or 1943.

Automatic, two 16" Bullard 6 station Mult-Au-Matics arranged for power chucking (no chucks). Two compound and three plain tool slides, extra high columns. Serial Nos. 18767 and 22,209, new in 1942 and 1943.

Automatic, 16" x 33" Fay, serial No. 82797, new in 1943. Has hydraulic chuck, front and rear tool slides and hydraulic tailstock.

Air Compressor, 1118 cu. ft., 20" & 12" x 16" Worthington "Feather Valve" duplex 2 stage, serial No. 24189. Has 195 HP General Electric 440/60/3 synchronous motor directly on shaft.

Boring Mill, 100" Niles-Bement-Pond Heavy Pattern. Two swivel heads with power rapid traverse. 35 HP, 230 volt direct current variable speed motor. Serial No. 17552.

Gear Generator, 12" Gleason straight path two tool rougher, Serial No. 20332, new in 1943. Has hydraulic work clamping and control.

Grinders, 6"x18", 10"x18", 14"x36", 16x36" & 20"x48" Landis type C hydraulic. New from 1941 to 1943.

Thread Grinder, No. 33 Excello automatic, serial No. 4459, new in 1942. Also have No. 35 Excello, universal type and about same age.

Internal Grinders, Nos. 16CP16, 16-28, 16F28 and 24-36 Bryant. All built after 1941.

Surface Grinder, 12"x16"x48" Thompson hydraulic, serial No. 4C084, new in 1941. Has 12"x40" magnetic chuck, both hand and hydraulic cross feed.

Lathe, Turret, No. 1L Gisholt saddle type universal, serial No. 27-627, new in 1942. Has air chuck, some tooling. Also have Nos. 3, 4, 5 & 3AL Gisholt.

Lathe, Turret, 36" Bullard "Spiral Geared" vertical, serial No. 19262, new in 1942. Has 3 jaw chuck table, cutting lubricant system.

Miller, Thread, Model CT-36 Lees Bradner, serial No. CT141, new in 1942. Has 13" hole through spindle.

Miller, No. 28-60 Cincinnati Hydrotel vertical, single spindle with down feed and hand controls. Serial No. 1H1V1L-313, new in 1942.

Millers, Cincinnati Hydromatic, most manufactured 1942 or later. Sizes: 3-24, 4-36, 4-48, 5-48, 56-72 and 56-90.

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICH.

National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.

2 Landis ¾" Bolt Formers and Threaders, M.D.

1 National ½" to 1" Hot Bolt Head Trimmer

Woodward & Powell 42"x42"x36 ft. 4 Head Planer

Cincinnati 36"x36"x16 ft. Planer, M.D.

1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

LATE TYPE TOOLS

30" Bullard Spiral Drive, 1943 tool

6" bar #360F & #560F Giddings & Lewis Horiz. Floor Type Mills, 1943

No. 2MH Cincl. Univ. Miller, 1944

36"x23' centers & 48"x18' centers Niles Lathes, Both new 1942.

Nos. 2, 3, 4, & 5 W. & S. Univ. Turrets, late

No. 48H Gould & Eberhardt Gear Hobbers

#72-A-3 Sizematic & #72-A-5 Plain Heald Internal Grinders, 1943 (10)

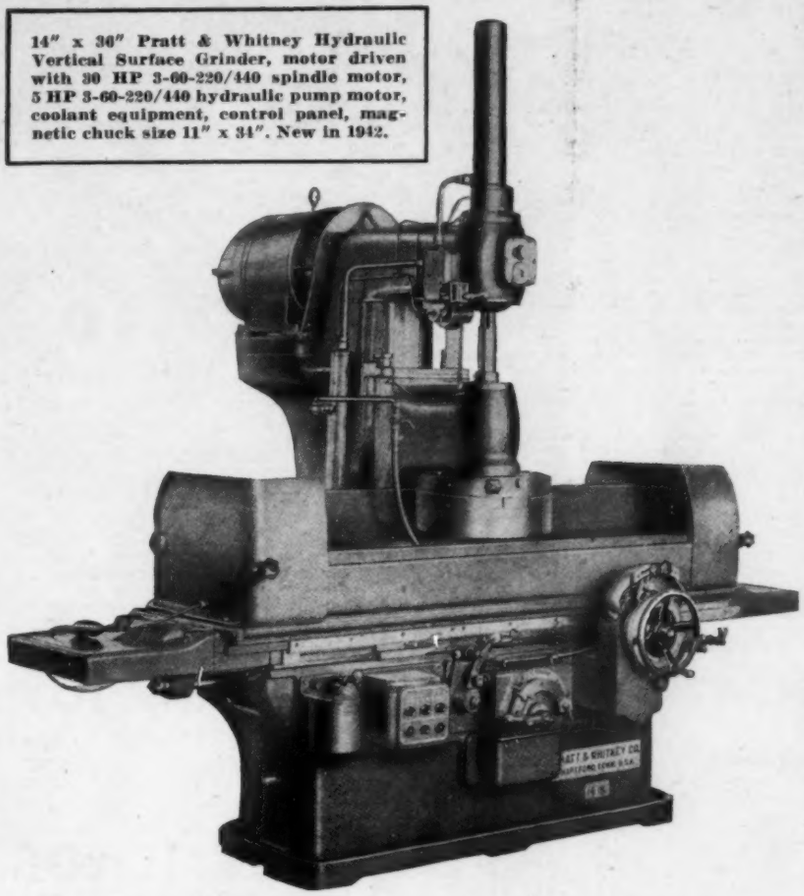
12" Gleason Gear Generators, 1943 (3)

6' Fosdick Radial, 10" col., 1943.

BENNETT MACHINERY CO.
30 Church St. New York 7, N. Y.

QUALITY *Machine Tools* NOW IN STOCK

14" x 36" Pratt & Whitney Hydraulic Vertical Surface Grinder, motor driven with 30 HP 3-60-220/440 spindle motor, 5 HP 3-60-220/440 hydraulic pump motor, coolant equipment, control panel, magnetic chuck size 11" x 34". New in 1942.



AUTOMATICS

2G Brown & Sharpe, H.S. 1½" capacity. New in 1943.
9/16 & 1" RA-6 Acme-Gridley. New in 1943.
1⅝" Conomatic 8-spindle. New in 1942.
5½" Cleveland Model A, single spindle.
6½" RA6C Acme Gridley Chucker.
16" x 33" Fay Automatic Lathe. 1941.
★Bullard Multaumatic, six spindle model D, single index. Late model.

BROACHES

No. 2SL LaPointe Hydraulic Horizontal. New in 1942.
No. CPC 6-36 LaPointe Hydraulic Vertical. New in 1943.

DRILLS

6' American radial 17" column.
★ No. 26HO Baker Hydraulic, single spindle, 3" capacity in steel, with motor and control. Latest type.
42" Cincinnati-Bickford, single spindle.
No. 3 Avey, three spindle, heavy duty.
No. 2 Motor Avey, six spindle MA6 model.
KH 2 Allen Sensitive Drill, 4 or 6 spindle.
No. 3 Baush Multiple Spindle.
Barnes Horizontal Deep Hole, 2 spindle.
Taft Peirce Horizontal, double end.

GEAR CUTTERS

No. 16H Gould & Eberhardt Universal Hobber. Latest type.
No. 7A, 7125A Fellows Gear Shapers.
No. 615A, 645A, Fellows Gear Shapers.
No. 12 Barber Colman Hobber.

GRINDERS

No. 2 & No. 3 Cincinnati Centerless, Filmatic spindle. 1941.
14" x 48" Cincinnati Universal, Filmatic bearing, internal spindle. New in 1942.
10" x 36" Landis Hydraulic. New in 1943.
6" x 18" Cincinnati Hydraulic, Filmatic spindle. New in 1943.
No. 3 Brown & Sharpe Universal. New in 1943.
No. 22 Heald Rotary Surface Grinder. New in 1943.
No. 18 Blanchard, 30" chuck. 1942.
14" x 16" x 60" Mattison Surface.
6" x 12" x 18" Thompson Surface Grinder. New in 1942.
16" x 16" x 48" Thompson Surface Grinder. New in 1943.
No. 75A Heald Internal. New in 1943.
No. 72-A-3 Heald Sizematic. New in 1943.
★ No. 74 Heald Internal Grinder, with 6 foot extension on bed for long work, adjustable work headstock on swivel table for long tapers.

LATHES, ENGINE

Lodge & Shipley Tool Room, 14" x 54", rel. att. New in 1943.
American Pacemaker, 16" x 30". 1942.
Lodge & Shipley 20" x 48". New in 1943.
★ Bertram 28" x 240" "Timesaver", two carriages, with rapid traverse. Canadian made from Niles patterns. 1942.
Lodge & Shipley 48" x 54", cone driven.
Carroll Jamieson 18" x 5', C.D.
South Bend 14½" x 6', c.d.
IMP Model Lo-Swing.
Lipe Carbomatic, 15" x 30".
LeBlonde Production, 17" x 30".

LATHES, TURRET

Warner & Swasey No. 4A, with chuck, 7½" hole.
Warner & Swasey No. 2A, preselector. New in 1943.
Warner & Swasey No. 1A, preselector. New in 1940.
Gisholt No. 1L, hydraulic speed selector. New in 1943.
Gisholt No. 5 Universal, Hydraulic speed selector. New in 1944.
Foster No. 5 Universal, Bar feed. 1943.
Warner & Swasey No. 4 Universal, preselector. New in 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal, two speed. New in 1942.
Bardons & Oliver No. 3 Universal, motor in base. New in 1941.
Warner & Swasey No. 2, oversize. 1942.
Bardons & Oliver No. 2 bar feed. 1941.
Brown & Sharpe No. 1, M. in B. 1941.
★ Bullard New Era VTL, 42".

MILLS

Cincinnati No. 2MH Universal. New in 1942.
Milwaukee No. 2H Universal. New in 1944.
Van Norman No. 2SU Universal.
Brown & Sharpe No. 3B Plain. New in 1943.
Brown & Sharpe No. 2B Plain.
Cincinnati No. 2MH Plain, latest model.
Milwaukee No. 2HL Plain with vert. att. New in 1943.
Cincinnati Vertical, No. 3 Med. S. Dial.
Milwaukee No. 3H Vertical, latest model.
Milwaukee Vertical, No. 2H. New in 1942.
Cincinnati Hydrotel, 28" x 60" single spindle, with depth control and 360° tracer.
Cincinnati No. 08 and 2-18 Rise and Fall.
Cincinnati No. 1-12 Automatic.
Cincinnati No. 3-36 & 4-36 Hydromatic.
DeVlieg Supermill No. 31B.
Whitney Hand Mill, No. 6.
★ 72 Betts Vertical Boring Mill, two heads, DC drive with AC/DC generator. New in 1943.

MISCELLANEOUS

No. 26F Norton Hydrolap.
No. 5B Standard OBI Press. New.
No. 7 Kling Punch, 1¼" through 1", 72" throat.
No. 8-6 Zeh & Hahneman S.S. Geared Press.
Pratt & Whitney Profiler, No. 12D.
Tapper, Leland Gifford 3' Radial, No. 3 MT. New in 1941.
24" Cincinnati Worm Feed Rotary Table.

PLANERS AND SHAPERS

American Planer, 22" x 5', m.d.
Cincinnati Planer, 42" x 42" x 20', D. C.
12" Vernon Shaper. New in 1941.
Cincinnati 20" Shaper, Universal table. New in 1943.
Cochrane & Bly No. 14 Vertical Shaper. New in 1942.
Pratt & Whitney 6" Vertical Shaper. New in 1943.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS
MACHINERY & SUPPLY CO., INC.
High Quality NEW, USED & REBUILT Machine Tools
1961 S. Meridian St., Indianapolis 6, Indiana
EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

MACHINE TOOLS—*Subject to Prior Sale*

DRILLS

3'11" CANEDY-OTTO — RADIAL — 220/3/60/1800 — LATE TYPE — 1942 Mfg.
3'9" AVEY — Sensitive — RADIAL — Belt Drive.

GRINDERS

#2 CINCINNATI — Tool & Cutter — 220/440/3/60 — Universal — Large assortment of accessories — LATE TYPE.
7"x11" LEACH — Plain Cylindrical — M.D. — 220/3/60 LATE TYPE — 1942 Mfg.
6"x18" MONARCH — Surface — Hand feed — XLO mtzd. Spdle — 550/3/60 — with chuck.
#3B ABRASIVE — Surface — Mfg. 1942 — back last eliminator — BB — cross ways
#60 HEALD — Cylinder.
10"x24" NORTON — Cam Grinder — Mtzd.
#13 BROWN & SHARPE — Universal — Tool & Cutter — Wet. attachment — Cabinet — Lg. assort. of access. — LATE TYPE — 1942 Mfg.
6"x32" NORTON — Plain Cylindrical — MD — 220/440/3/60.
#70 HEALD — Internal — 220/3/60 — MD.
#2 CINCINNATI — Centerless — "Filmatic" — Late Type

LATHES & TURRETS

20"x54" REED-PRENTICE — 16 speed — Geared Head — Taper Attach. — 220/440/3 — with additional equipment — LATE TYPE — 1942 Mfg.
14"x30" LODGE & SHIPLEY — 12 speed — motor in base — TA — chuck — stops — 4 way tool post — 220/440 — other equipment — 1941 Mfg.
14"x6' HENDEY — Geared head — factory MD — chucks — less mtr.
16"x6' HENDEY — QCG — Taper attachment — Chuck — Collets — MD.
#5 JONES & LAMSON — Universal Turret — LATE TYPE — 1943 Mfg.
#2 WARNER & SWASEY — PF to turret — Cross slide — BD — arr. MD.
#3 WARNER & SWASEY — Universal Turret — late type — chucking
14x8' Monarch — Engine — BG — Chuck, collets, motorized, Turner drive

MILLING MACHINES

#2 BROWN & SHARPE — Plain Horizontal — Light Type — Mfg. 1943
#3K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base —LATE TYPE — 1943 Mfg.
#3H K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1943 Mfg.
#2K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1942 Mfg.
#34 OHIO — "Osterlein" — Universal — Belt drive — New dividing heads.
#2—24 CINCINNATI — Rise and fall — LATE TYPE — 1942 Mfg.
#3H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#2H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#5 BECKER — Vertical — Belt drive — Motor bracket — 12x48" table.
#1 United States — Hand — complete 220/440 late type — 1942 Mfg.

SAWS

#4C COCHRANE-BLY — Cold — inserted tooth blade — MD — 220/3/60.

SCREW MACHINES

#2 BROWN & SHARPE — hand — wire feed — late type
#0G BROWN & SHARPE — Fully automatic — Vertical slide attachment — Serial No. 7500.
#00G BROWN & SHARPE — Fully automatic — Serial No. over 11,000 — Motor driven slotting attachment — Swing stop and equipment — LATE TYPE.
#R4 NATIONAL ACME — 4 spdle — Fully automatic — 3⅛" cap. — 220/440/3/60 — complete assortment of equipment — LATE TYPE.
#0 BROWN & SHARPE — Fully automatic — Belt drive.
#R NATIONAL ACME — 4 spdle — Fully automatic — 1⅜" cap. — LATE TYPE — Extra equipment.
2" GREENLEE — 6 spdle — Fully automatic — Motor driven — LATE TYPE — 1942 Mfg.
3¼" ACME-GRIDLEY — Single Spindle — complete tooling — AC — motor drive.

SHAPERS

28" AMERICAN — Back geared — Power feed to head — Single pulley drive.
24" GOULD & EBERHARDT — Crank — Motorized with 4 speed drive.
7" LOGAN — Floor type — 110/1/60 — NEW.
16" Stockbridge Crank backgeared CD — with vise

SHEARS

36" PEXTO — Power squaring — Motor drive — 16 ga.
42" WHITNEY — Power squaring motor drive — 220/3/60 — 16 gauge — NEW.

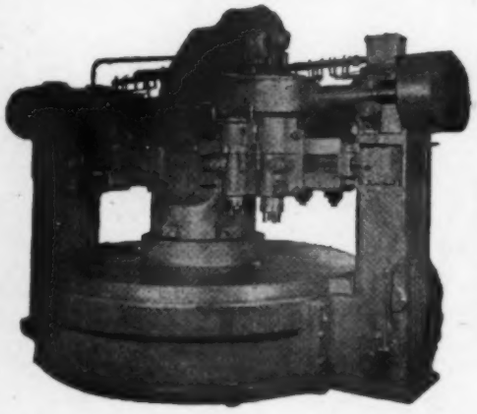
MICELLANEOUS

PLANER — Woodward & Powell — 30"x30"x12' — 2 rail heads — 2 side heads — Down feed and elevation — Box bed — BD.
PLANER — Whitcomb — 24"x24"x6' — Arr. for motor drive — Less elec. equip. — 1 rail head.
Boring Mill — Universal — 3" bar — horizontal — MD — 220/3/60.
GEAR CUTTER — Henry Reuson — #6 — 72" spur.

UNITED MACHINERY & TOOL CORPORATION

34 HERMAN STREET — WORCESTER 8, MASS.

Newton Type V-4 Continuous Rotary Milling Machine



Equipped with 2 double heads, and 2 single heads, diameter spindle sleeves 6⅝" complete with 25 H.P. motor.

An ideal machine for continuous production of cylinder blocks, bases and a multitude of similar parts.

EMERMAN MACHINERY CORP.

875 W. 120TH ST. — CHICAGO 43, ILL.

REYNOLDS of Providence *OFFERS:*

#3-36 Cincinnati Hydromatic Duplex Milling Machine. New January 1942. Table size 12" x 48", Table travel 36". Motors 220/3/60 AC. Extra Auxiliary table, machine like new. Cost today over $10,000. Our special low price $4,000.

800 lb. Standard Automatic Drop Hammer. Like New. 15HP motor drive, 220/3/60 AC Steel, insert in bed. Safety guard. Price $5,500.

Also 100 lb & 500 lb Standard Automatic Drops in Stock.

REYNOLDS MACHINERY CO.

305 EDDY ST., PROVIDENCE 3, R. I.
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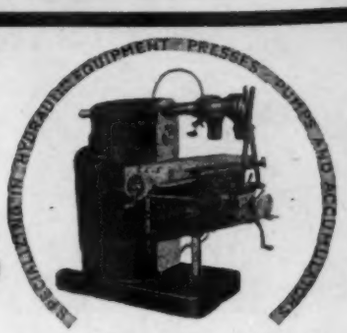
AARON VALUES IN MODERN TOOLS



MACHINE TOOLS

SPECIALS

Clearing 90-10 Press Brake—10' 10 Ga.

Van Norman #12, 36
56 Ton Thomas OBI Press, New 1947
Gorton Duplicators and Vert. Millers
Gorton No. 3Z, 3L, ID, ME Engravers
Marvel 6A Hacksaw, M.D., Auto. Feed
Injection Moulders, Hydraulic Presses
Norton No. 2 Tool & Cutter Grinder, late
Bakewell No. 1 Tapper
Sellers Wet Drill Grinder 6G, late
Abrasive 6x18, 8x24 Surface Grinders
Conomatic 1⅞" 8 spindle, Late Type
Brown & Sharpe No. 2 Univ. Grinder, Late
Thompson Seam Welder Mod. 26, Rafter, New 1945

BORING MILLS

#0 Giddings & Lewis arr. M.D.
2½" Cleveland arr. M.D., 2½", 4" Binsse
Niles-Bement-Pond 4" duplex, Universal 3"
60" Niles; 54" Colburn M.D. 2 hds.
Bullard New Era 24", 42", Vert. M.D.

TURRET LATHES

W. & S. Nos. 3, 4 Grd. Hd., Preselector
Gisholt No. 1L, 2L Univ. M.D., Late
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x30"
Acme #2 M.D.
Oster 601 Rapiduction, Late
Hardinge ESM, 2nd operation, late

GRINDERS

Abrasive 3B 8"x24" Surf., #34 Vert.
#25 Gallmeyer & Livingston Hyd. Surf. 6x18, Late
#25A Heald, M.D. like new Rotary Surf.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 68, 63 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.; 1, 3 Univ.
Norton 6x18", Hyd. Surface, M.D., New 1942
Covel #91A Tool, New 1941, Cinn.
Hammond #4 & Excello #44 Carbide Grinder

LATHES

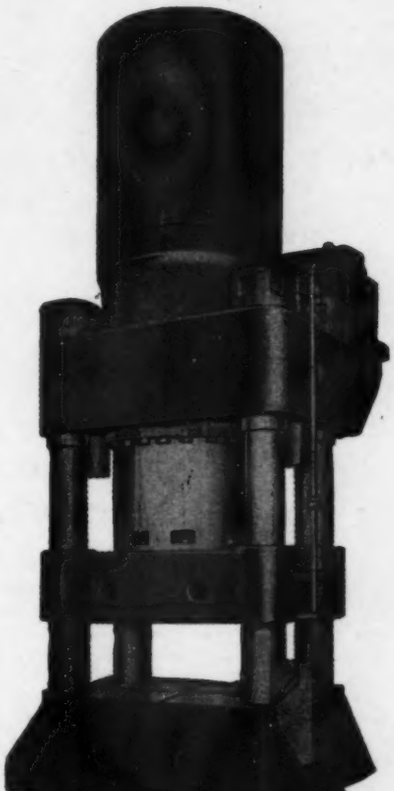
24"x12' Springfield Grd. Hd.
Monarch, Hendey 12x30, 10x20 G.H. Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
20"x30' Boye & Emmes Grd. Hd., Late
South Bend, M.D., T.A., 10"x10', 9"x3', Late
Sundstrand Centering Machine #36, 6"x36"
Sebastian 12"x4' grd. hd. late
Wade, Hjerth, Hardinge, P & W Precision Bench

AUTOMATICS

Conomatic 8 spindle, 1⅞" Late, Equipment
Cleveland Model A ⅜", 1¼", 2"; B 1", 2", ⅜" Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto, #2 Hand

MILLING MACHINES

Cinn. #3 Pl., #4 Vert. Dial Type, Rect.
3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K & T Univ.; No. 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No. 1, 3 Vert.
B. & S. #12 Elec. Prod. late type, #21
Gorton 8D, 9J, hand feed, Like new
Gorton 8D, 9J power feed, Like new
Gorton 9J Duplicator



1300 Ton Watson Stillman Hydraulic Press

NEW IN STOCK

Power Shears—52", 72" & 96"

Spot & Arc Welders
5, 7, 14, 18 & 30 ton OBI Power Presses
Ammco 7", Shaps Rite 8", Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
6x6" Racine Hacksaw; #8 Marvel
20 ton Northern Hydraulic Presses

RADIALS

4' Fosdick 13" col., 8' Carlton, 19" col. M.D.
6' Cincinnati-Bickford
4', 5', 6' American Triple Purpose
Canedy-Otto 3'11" Col. M.D. on Spindle
Walker-Turner, ½" cap.

HYDRAULIC EQUIPMENT

1300 TON WATSON STILLMAN HYDRAULIC PRESS Self Contained

Platen size 48"x42". Stroke 22". Opening 48". Ram Diameter 35". Driven by 50 H.P. motor, also.
250 Ton Wheel Press, 76" Vertical space between bars
Watson Stillman 500 ton Shaft Straightener, Self-Contained Press, equal to new

600 TON SOUTHWARK PRESS

Self contained 48"x48" platen size, 65" stroke, 110" opening, 50 H.P. motor, 3 phase, 60 cycle, 220v.

1000 TON H.P.M. PRESS

Self Contained

Platen 72"x48". 36" stroke. 36" opening 40 H.P., 3 phase, 60 cycle, 208-416 V motor.

1140 TON SOUTHWARK PRESS

Not Self Contained

Platen 11' 11" left to right, 11' front to rear. 48" stroke. 60" opening.

2000 TON BIRDSBORO PRESS

Self Contained

60" between rods left to right, 53" front to rear. Overall length of platen left to right 144". Stroke 30". Opening 38". 60 H.P., 3 phase 60 cycle, 220-440 V motor.

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

MISCELLANEOUS

Mitts & Merrill, Keyseaters
Wiedman Turret Punch—Type R4P
Buffalo #0 Angle Roll M.D.
Bliss #58-OB Gap Presses, 62, 62A, 162
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Pexto 8' Power Shears
Burke & Nichols Millers, Pl. & Univ.
Delta Single & Multiple Drills
Deckel G1, G2, GIF Engraving machines
Hanson-Whitney Thread Miller
Oliver Heavy-Duty die making machine
J &L bench comparator
Taylor-Winfield 50 KVA Spot Welder
Leland-Gifford 1, 2 & 4 spindles, Model MS

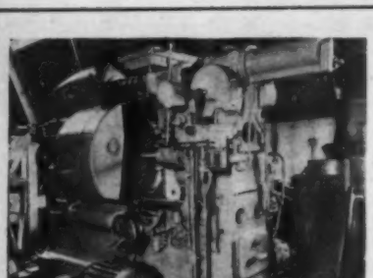
WRITE FOR OUR FREE ILLUSTRATED CATALOG

AAron Machinery Co., Inc.

45 CROSBY STREET • NEW YORK 12, N. Y.

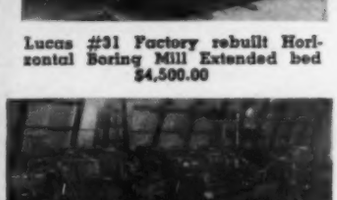
MDNA MEMBER

WO. 4-8233 **CABLE—AARMACH**



BRYANT Internal Grinder 24x36 new 1943 $3800.00

Lucas #31 Factory rebuilt Horizontal Boring Mill Extended bed $4,500.00



WARNER & SWASEY #3 Universal Turret Lathes with air chucks new 1945

GOOD MACHINES HARD TO FIND

2 CHICAGO Pneumatic Horizontal Air compressors 106 CFM.

NEW BRITAIN GRIDLEY, Model 60-6 spindle, 1" bar machine, new 1943 and Model 61 2¼"-6 spindle bar machine new 1943 also Model 61—1⅝" bar machine new 1943.

ACME GRIDLEY RA6, 2⅝" Bar Machine 1942.

GOULD & EBERHARDT 84" spur gear cutting machine.

BARDONS & OLIVER #7 Universal turret lathe 2½" bar capacity.

CINCINNATI Tool Room Planer 36x36x8', Box table, 2-heads on rail, excellent condition, also 42x42x8'.

BULLARD and COLBURN Vertical boring mills 36", 48", 54".

CINCINNATI Model 2-18 Automatic milling machines, new 1943.

ABRASIVE Surface Grinder Model M3, new 1943.

BROWN & SHARPE Model 2G 1½" Spindle opening, new 1941.

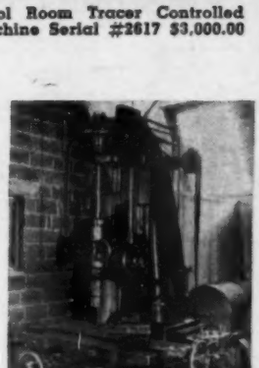
OTHER GOOD MACHINE TOOLS

GENERAL MACHINERY & EQUIPMENT CO.

140 S. 17th St., Harrisburg, Pa.

Warehouses in **Harrisburg, Lancaster & Philadelphia, Pa.**

KELLER Tool Room Tracer Controlled Milling Machine Serial #2617 $3,000.00



PRATT & WHITNEY Jig Borer #2 $2200.00

UNUSUAL VALUES

Milling Machines—#1, Universal, #1 American (new) plain, #1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe #3—26", Gould & Eberhardt 42".

Grinders—Cylinder B & S #11, Planer type 16"x36", Surface 13"x62", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6' 8', 10'—16"x8', 8', 10'—18"x8', 8', 10'—36"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.

Large stock 19" and 13" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 36", 40".

SPECIAL—New totally enclosed, dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt #25—24" Hi Duty. 3" capacity in steel, motor attached.

PATTERN MAKING MACHINERY—12"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

GEAR CUTTERS

NEW — H.S. STEEL • FIRST QUALITY

INVOLUTE 1P to 48P } *ALL LISTED*
BEVEL 3P to 24P } *PITCHES*

LESS 50% DISCOUNT

SEND FOR OUR BARGAIN CIRCULAR

DeWITT TOOL CO. 173 Grand St., N. Y. 13, N. Y.

FOR SALE

#92½E Toledo S. S. Dbl. Crank Press, 100-ton cap., tie-rod constr., 24"x60" bed, 8" str., 16" shut ht.

Dreis & Krump 10'x3/16" Power Squaring Shear, modern machine, excellent condition

Loy & Nawrath 10'x14 Ga. Power Squaring Shear, complete, now in operation

PRICED RIGHT FOR QUICK SALE

PUNCH PRESS SALES CO.
1800 E. Forest Detroit 7, Mich.
TEmple 2-6030

No. 1½ B & S Universal Mill, M.D.
LeBlond 36"x30' geared head Lathe
No. 2B Foster Turret Lathe

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N.Y.

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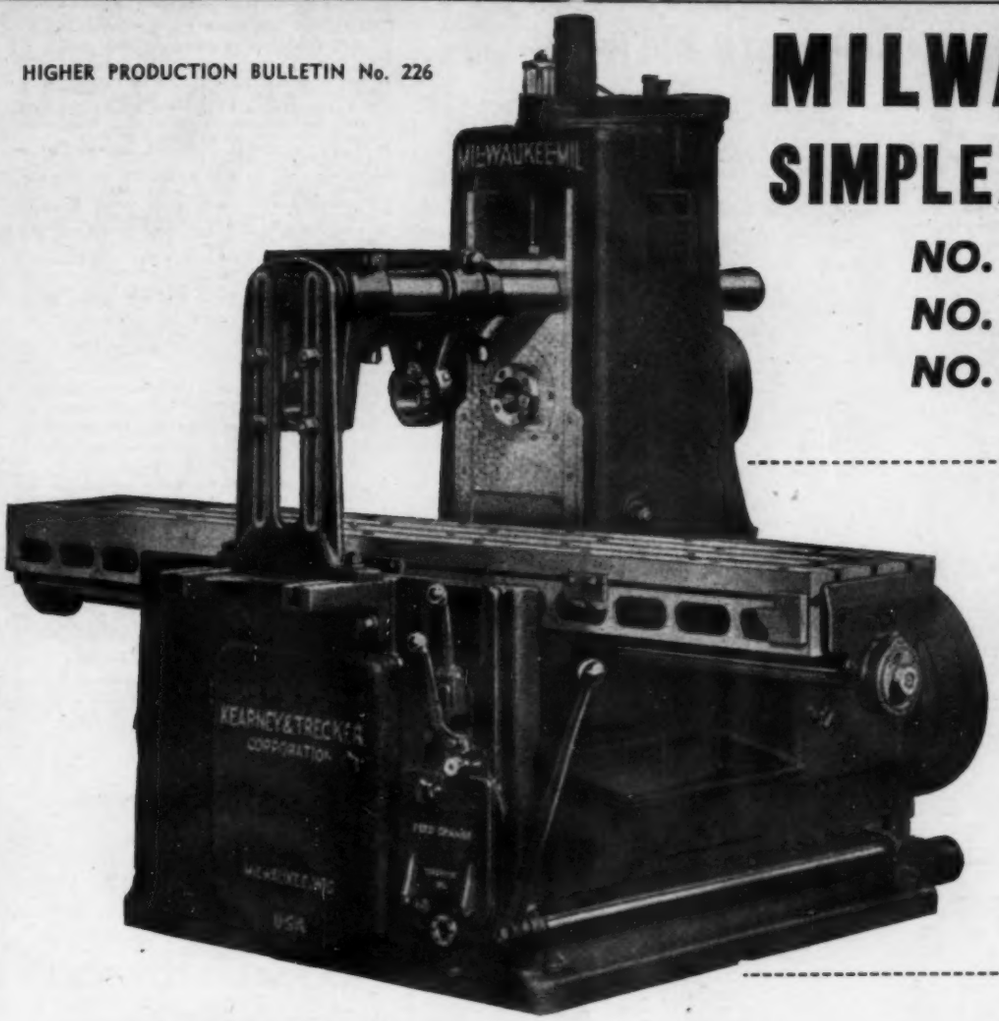

MILWAUKEE SIMPLEX MILLS

NO. 1402
NO. 1403
NO. 1404

SPECIFICATIONS

Timken Bearings
Rapid Traverse . . . 240" per min.
Spindle Speeds . . . 12.
Motor and Controls complete.

TABLE FEEDS — Power

No. 1402	24"
No. 1403	36"
No. 1404	48"

EMERMAN MACHINERY CORP.

875 W. 120TH STREET — CHICAGO 43, ILLINOIS

FOR SALE

#4 Cincinnati Vertical Mill, single pulley with 10 HP motor, $1200.00
30"x12' Schumacher-Boye Engine Lathe, motorized change gear type, $1000.00
24"x24"x8' Liberty Double Housing Planer, rail head and side head, overhead motor drive, rebuilt, $4500.00
7½"x6" Chicago Pneumatic Air Compressor with 24"x60" receiver, 10 HP, 860 RPM motor, $450.00
6x32" Norton Cylindrical Grinder, C.S. drive, $125.00
4—new 6"x24" LaSalle Surface Grinders, hand feed
6—new 6"x24" LaSalle Surface Grinders, hydraulic feed
112"x76"x28' Liberty Convertible Planer, 4 heads, latest type with variable voltage drive
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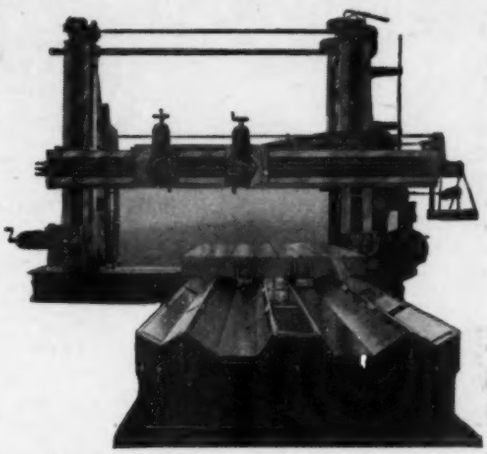

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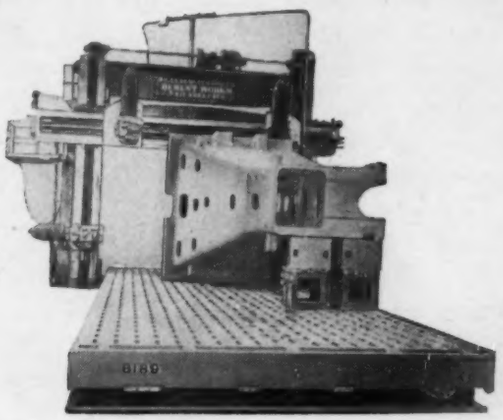

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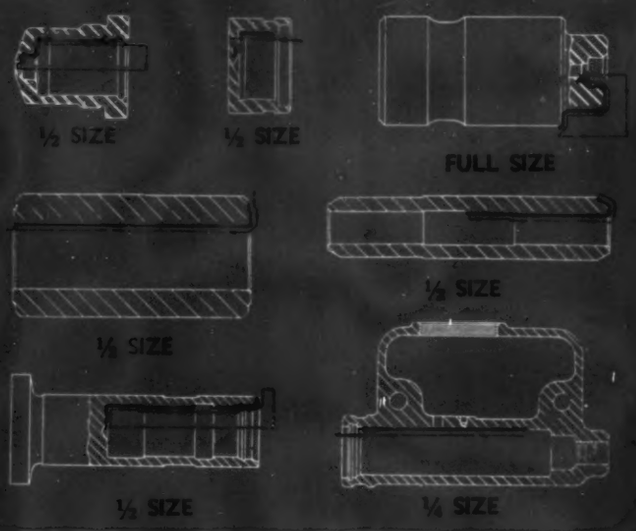
New boring and turning machines TO BROADEN YOUR PROFIT MARGIN

Model 36



On one of the parts illustrated the bore specifies a .0005 back taper. Many bores have a .001 total limit. On one job the production rate is 1,080 pieces per hour; on another, production was increased from 180 to more than 300. Specifications for the valve guide call for a .0001 limit on size from one end to the other, .0002 for concentricity, and a .0006 limit from piece to piece.

Money-saving speed, accuracy and ease of operation make this new line of precision contour turning and boring machines earn their way. Cam and air actuated, the tools positively repeat from piece to piece unaffected by temperature variations.

High production is assured by high spindle speeds and lifetime sealed lubrication of spindle bearings, and by the fact that 2 or more pieces are finished simultaneously with rapid traverse on all idle motions.

An unlimited variety of set-ups can easily be arranged. In addition to straight boring and turning, facing and chamfering, it will accurately follow contours cut on its cams, and will produce lands, recesses, flanges, steps, counterbores, and radii . . . all with a single point tool. Only one dimension cut by this tool requires inspection.

The Machine Tool Show unquestionably demonstrated the enormous new possibilities of automatic machinery. Are you falling behind your competitors by not at least investigating? We will gladly show you how we are changing expensive boring and turning operations into profitable productivity. *Productivity, not price, is the measure of a machine.*

NEW BRITAIN AUTOMATICS
COST LESS PER FINISHED PIECE.

THE NEW BRITAIN MACHINE CO.
NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

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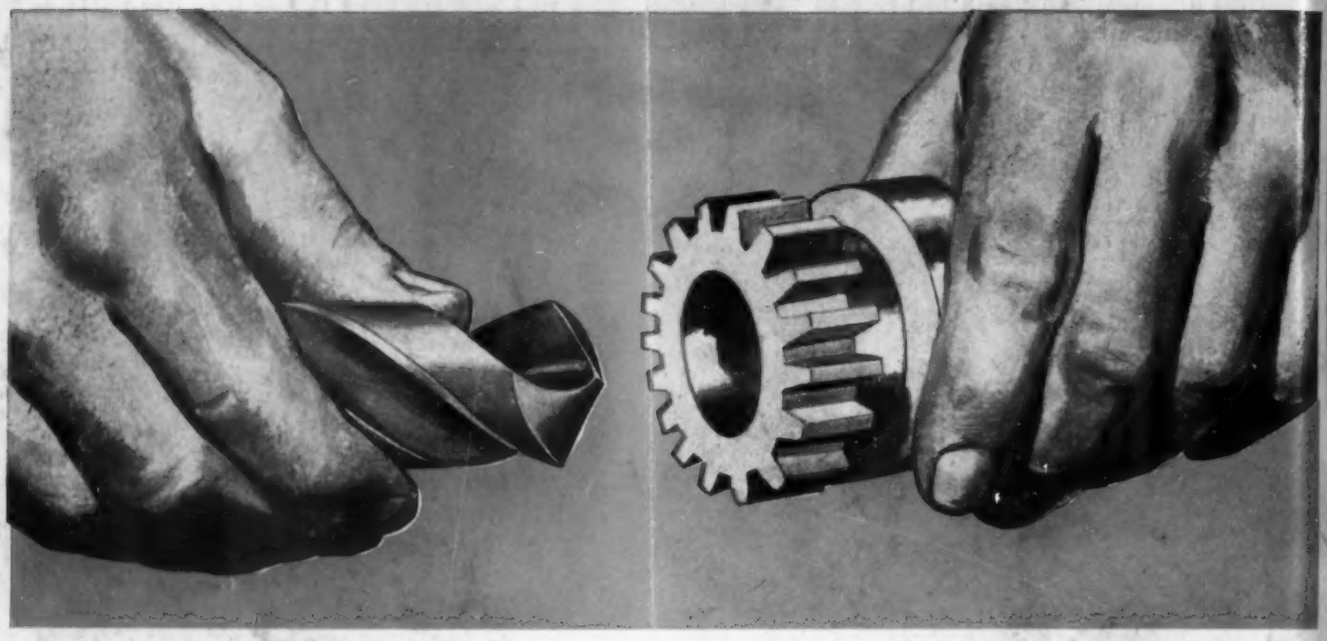
Are you throwing money down this hole?



Save drilling time, scrap loss . . . with Timken tubing!

THERE'S no center hole to drill and less stock to machine when you make hollow cylindrical parts out of Timken seamless tubing. Finish boring is often your first step in production.

And because the piercing of Timken tubing is basically a forging operation you get added strength for your product as well as lower cost. Red hot billets are worked between the rolls and forced over the piercing point with a spiral, kneading action that thoroughly works the metal from the inside, from the outside, and throughout the entire cross section.

This thorough hot-working of metal results in uniform grain flow and refined grain structure. And the Timken Company's complete control of every manufacturing step—from melt shop to final tube inspection—assures you of uniformity from tube to tube and from heat to heat. You can always count on uniform response to your machining and heat treating operations.

Why not see if Timken seamless tubing can give you a higher quality product for less money than you are now spending? Our experienced Technical Staff will be glad to make an "on-the-job" analysis for you . . . without obligation, of course. Address your letter to Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

TIMKEN

TRADE-MARK REG U S PAT OFF

Fine Alloy

STEEL

and Seamless Tubes

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.